

THE SHIFTING GEOPOLITICS OF OIL AND GAS

HEARING
BEFORE THE
SUBCOMMITTEE ON ENERGY
OF THE
COMMITTEE ON ENERGY AND
COMMERCE
HOUSE OF REPRESENTATIVES
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THE SHIFTING GEOPOLITICS OF OIL AND GAS

TUESDAY, JUNE 26, 2018

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON ENERGY,
COMMITTEE ON ENERGY AND COMMERCE,
Washington, DC.

The subcommittee met, pursuant to call, at 1:39 p.m., in room 2123, Rayburn House Office Building, Hon. Fred Upton (chairman of the subcommittee) presiding.

Members present: Representatives Upton, Olson, Barton, Shimkus, Latta, Harper, McKinley, Kinzinger, Griffith, Johnson, Bucshon, Flores, Mullin, Hudson, Walberg, Duncan, Walden (ex officio), McNerney, Peters, Green, Welch, Tonko, Kennedy, Butterfield, and Pallone (ex officio).

Staff present: Mike Bloomquist, Staff Director; Samantha Bopp, Staff Assistant; Karen Christian, General Counsel; Kelly Collins, Legislative Clerk, Energy/Environment; Wyatt Ellertson, Professional Staff Member, Energy/Environment; Margaret Tucker Fogarty, Staff Assistant; Adam Fromm, Director of Outreach and Coalitions; Theresa Gambo, Human Resources and Office Administrator; Jordan Haverly, Policy Coordinator, Environment; Bijan Koohmaraie, Counsel, Digital Commerce and Consumer Protection; Mary Martin, Chief Counsel, Energy/Environment; Sarah Matthews, Press Secretary; Drew McDowell, Executive Assistant; Brandon Mooney, Deputy Chief Counsel, Energy; Mark Ratner, Policy Coordinator; Annelise Rickert, Counsel, Energy; Peter Spencer, Senior Professional Staff Member, Energy; Austin Stonebraker, Press Assistant; Madeline Vey, Policy Coordinator, Digital Commerce and Consumer Protection; Hamlin Wade, Special Advisor, External Affairs; Caitlin Haberman, Minority Professional Staff Member; Rick Kessler, Minority Senior Advisor and Staff Director, Energy and Environment; John Marshall, Minority Policy Coordinator; Alexander Ratner, Minority Policy Analyst; Tuley Wright, Minority Energy and Environment Policy Advisor; and Catherine Zander, Minority Environment Fellow.

Mr. UPTON. Good afternoon. Sorry we are a little delayed in starting, but we had three votes on the House floor, and they are just finishing up. And so we will get started.

OPENING STATEMENT OF HON. FRED UPTON, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF MICHIGAN

So, good afternoon, and, certainly, welcome to this Energy Subcommittee hearing on “The Shifting Geopolitics of Oil and Gas.”

So this hearing is especially timely because here in DC, right now, energy ministers and CEOs from around the world are gathering for the 27th World Gas Conference to examine important opportunities in energy trends happening across the globe. And while it's an international conference for sure, the U.S.'s role as a world leader in energy is sure to be the focus.

So, before we arrived at this current era of energy abundance, some of you may remember that as little as a decade ago America's energy landscape was in a lot different state than it is today.

In 2005, American domestic oil and gas production was declining and the country reached a point of peak reliance on foreign sources of energy, and at that time we were importing eight times more energy than we were exporting and we were becoming increasingly dependent on OPEC nations for our energy needs.

It was right around that time that this important technological breakthrough pioneered by American companies—namely, horizontal drilling and hydraulic fracturing—dramatically altered our energy outlook.

These technological breakthroughs led to a surge in domestic oil and gas production, decreasing U.S. reliance on energy imports.

As for today, and we will see that this trend has not slowed down—in fact, energy—EIA projects that by 2022, the U.S. will become a net energy exporter for the first time in over half a century.

It should be noted that America's emergence as a major energy supplier to the world is thanks, in part, to Congress' lifting the 40-year-old crude oil export ban in 2015, and I would note, that was bipartisan. President Obama signed it into law.

Removing the ban has enabled our companies to take advantage of global energy markets and has resulted in more American jobs for sure, a stronger economy for sure, lower emissions, indeed, and it's helping to reduce our trade deficit.

The national security and energy security benefits provided by the shale energy revolution cannot be overstated. Every day, we are less dependent on foreign nations and cartels, such as OPEC, to meet our domestic energy needs.

Instead, we are now employing American workers and American technologies to harness our own standard and abundant domestic resources in a way that is growing the economy, protecting the environment, and improving our energy security.

So today we are holding this hearing to take a closer look at how the U.S.'s growing role as a global energy leader is benefitting consumers and enhancing the Nation's standing on the geopolitical world stage.

To provide insight on these topics, we have a great panel of four witnesses with extensive experience working in and around the U.S. oil and gas industry.

As part of today's panel we have Dr. Daniel Yergin, a Pulitzer Prize-winning author and a world-renowned energy expert who many of us say literally wrote the book.

Dr. Yergin is joined by Harold Hamm, the CEO of Continental Resources, which is a highly successful oil exploration and production company that he himself founded, and he had an instrumental role in making sure that we lifted that crude oil ban.

We also have Dennis Arriola, the chief strategy officer for Sempra, a Fortune 500 energy services company that serves 40 million customers—consumers around the world.

And rounding up the lineup, we have got Dr. Kevin Kennedy, a deputy director at the World Resources Institute, a global research organization that spans more than 50 countries and focuses on the nexus of environment economic opportunity and human wellbeing.

So I want to thank all of you for joining us, for twiddling your thumbs for 30 minutes while we cast some mighty important votes on the House floor, and I now yield to the acting ranking member of the subcommittee, Mr. McNerney, our friend from California, taking Bobby Rush's place this afternoon, who's getting married.

[The prepared statement of Mr. Upton follows:]

PREPARED STATEMENT OF HON. FRED UPTON

Good afternoon, and welcome to this Energy Subcommittee hearing on the shifting geopolitics of oil and gas. This hearing is especially timely, because here in Washington DC, energy ministers and CEOs are gathering for the 27th World Gas Conference to examine important opportunities and energy trends happening across the world. While it's an international conference, the United States' growing role as a world leader in energy is sure to be in focus.

Before we arrived to this current era of energy abundance, some of you may remember that as little as a decade ago, America's energy landscape was in a much different state than it is today. In 2005, American domestic oil and gas production was declining and the country reached a point of peak reliance on foreign sources of energy. At that time, we were importing eight times more energy than we were exporting and we were becoming increasingly dependent on OPEC nations for our energy needs.

It was right around this time that important technological breakthroughs pioneered by American companies, namely horizontal drilling and hydraulic fracturing, dramatically altered our energy outlook. These technological breakthroughs led to a surge in domestic oil and gas production, decreasing U.S. reliance on energy imports.

Fast forward to today, and we see that this trend has not slowed down. In fact, the Energy Information Administration projects that by 2022 the United States will become a net energy exporter for the first time in over half a century.

It should be noted that America's emergence as a major energy supplier to the world is thanks, in part, to Congress lifting the 40-year-old crude oil export ban in 2015. Removing this ban has enabled our companies to take advantage of global energy markets and has resulted in more American jobs, a stronger economy, lower emissions, and is helping to reduce our trade deficit.

The national security and energy security benefits provided by the shale energy revolution cannot be overstated. Every day we are less dependent on foreign nations and cartels, such as OPEC, to meet our domestic energy needs. Instead, we are now employing American workers and American technologies to harness our own abundant domestic resources in a way that is growing the economy, protecting the environment, and improving our energy security.

Today, we are holding this hearing to take a closer look at how the United States growing role as a global energy leader is benefiting consumers and enhancing the Nation's standing on the geopolitical world stage. To provide insight on these topics, we have a panel of four witnesses with extensive experience working in and around the U.S. oil and gas industry. As part of today's panel we have Dr. Daniel Yergin, a Pulitzer Prize-winning author and a world-renowned energy expert. Dr. Yergin, is joined by Mr. Harold Hamm, the CEO of Continental Resources, which is a highly successful oil exploration and production company that he himself founded. We also have Mr. Dennis Arriola, the chief strategy officer for Sempra Energy, a Fortune 500 energy services company that serves 40 million consumers around the world. And rounding out the lineup, we have Dr. Kevin Kennedy, a deputy director at the World Resources Institute, a global research organization that spans more than 50 countries and focuses on the nexus of environment, economic opportunity, and human wellbeing. I'd like to thank each of these witnesses for joining us and I look forward to their thoughts on what the future holds for the U.S. energy sector.

OPENING STATEMENT OF HON. JERRY MCNERNEY, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA

Mr. MCNERNEY. Getting married Saturday.

Well, thank you, Mr. Chairman, for yielding to me. I want to thank the panelists, and I think you're all interesting and I am looking forward to hearing what you have to say, and I hope we get a very diverse set of opinions about the issues here.

It's important to have this conversation with industry leaders and with policy leaders and with people that understand the business.

We have world gas conference nearby and this is topical, but the topic that's listed here—the shifting geopolitics of oil and gas—is a little too narrow.

We should be including other topics like renewables, storage, and other resources that are impacting our energy markets. LNG and crude oil exports have changed in the last decade.

When I first got elected in 2007, we were worried about our dependence on foreign oil. That's changed. That's possibly a good thing. But we continue to need a very diverse—we continue to need a very diverse energy mix. It won't help us, I don't think, to depend—become overly dependent on oil and/or gas.

We need political compromise to get there. If one side or the other dominates, I think we are going to go down a path that's unsustainable. So we need political compromise on this and all the other issues including tax reform.

Renewables—you know, the interesting things is that the energy market is really shifting to electricity now. We have electric vehicles growing, especially in California but in other States as well.

So we are going to see more and more dependence on electricity as a product. It's not necessarily a resource but as a product. So we need to be—we need to have policies that's going to support that shift.

We have energy storage, another thing that's going to be very important in terms of shifting where we get our energy from.

Concerning the Paris agreement, the United States was a leader in this agreement. We are still in the—we are still in terms of cities and States declaring that they are going to continue to abide by the terms of the Paris Climate Accord. I think that's very inspiring to me.

And I want to say to the witnesses, Dr. Yergin, your scholarship has advanced the field of energy. I really appreciate what you've been able to accomplish in terms of providing the history.

And one of the things that strikes me about your scholarship is that we see a cyclical market. The oil market goes in very big cycles about every 10 or 15 years, and right now we are on a low energy cost part of that cycle.

But I think that's probably going to change in another 5 years, based on history—nothing more.

Mr. Kennedy, World Resources Institute climate initiative is a the gold standard for providing advice. So thank you for coming today.

Mr. Arriola, Sempra holds utilities in my home State and has a diverse generation of energy assets here and abroad. I hope it stays that way.

And Mr. Hamm, you have been a leader, and I appreciate what horizontal drilling has done to the energy markets in this country. We need to keep an eye on that to make sure that it doesn't cause problems in our States.

We know that there is problems with earthquakes. We know that there is potential problems with groundwater contamination and so on. So it's important to keep an eye on that.

At any rate, I am going to yield if any Democrats want to take a minute or two, and with that I yield back to the Chair.

Mr. UPTON. The gentleman yields back. The Chair recognizes the chair of the full committee, Mr. Walden, for an opening statement.

OPENING STATEMENT OF HON. GREG WALDEN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF OREGON

Mr. WALDEN. Thank you very much, Mr. Chairman. To our panelists, welcome. Thank you for being here today and sharing with us on these issues that are so important. We have an excellent lineup of witnesses, Mr. Chairman, and we are going to learn a lot.

This is, of course, a big week in Washington, DC. It is when America hosts the World Gas Conference. They call it the Olympics of natural gas, and indeed, it is.

It brings together hundreds—actually, thousands of participants in energy ministers and CEOs from global energy companies to discuss strategic, commercial, and technical issues facing this really important American industry.

It's been 30 years. Ronald Reagan was president the last time America hosted this and the energy picture was quite different then than it is today.

So it's kind of interesting to reflect back on those times. But today, the United States is the world's number-one producer of petroleum and natural gas. Our markets are more open, transparent, and competitive than they've ever been.

Prices for consumers are low and stable. There are always ups and downs. But we have cut our imports by about 75 percent since they peaked in 2005, and if this trend continues we will be net energy exporters in just a few short years.

We got there by repealing the Jimmy Carter era supply and price controls to encourage a free market for energy commodities.

We have taken steps to improve our regulatory policies—we know we have a lot more to do there—and reform our outdated tax code to encourage domestic production.

Piece by piece, we have removed restrictions on energy trade to allow American energy to compete in the global marketplace, and Mr. Hamm's done a lot in that effort globally.

Most recently, as Members on this committee will remember, we repealed the 40-year-old ban on crude oil. Now, just 2 years later, we are exporting more than 1½ million barrels per day of crude oil to countries around the world.

This is big. The shale revolution, now 10 years in the making, has had an enormously positive impact on the economy. It's created hundreds of thousands of jobs, billions of dollars in investment that

wouldn't have happened were it not for our energy abundance in the United States.

The jobs and investments are widespread. They are across all sectors of the economy in all 50 States. It's also had a big impact on our power sector and with the shift to abundant and cheap natural gas we have seen a huge reduction in our carbon emissions—enormous.

In fact, the U.S. is leading the world in reducing carbon emissions, and by a large margin. Since peaking in 2005, our carbon emissions have declined steadily and this trend looks likely to continue.

This just goes to how you don't always need a Government mandate to get it done if you believe in the free market system and innovation that comes from it.

We can do a lot of cleanup of the environment and create great American jobs and develop American energy. So we are seeing these benefits today, and as we emerge as the world-leading LNG exporter, our trading partners will share in this good fortune.

The outlook for American energy is bright, with plentiful reserves, a highly skilled workforce, pro-growth regulations.

Our energy production will continue to grow and, with this growth, America will see even greater economic, geopolitical, and environmental benefits along with additional opportunities to help our American allies abroad who are in need of reliable and affordable supplies of energy, not held hostage for their energy by less than friendly countries.

I'd like to thank the witnesses again for participating today and we appreciate you sharing your experiences, your knowledge, and your ideas with us about how we can continue to grow American jobs, develop American energy, and enjoy the economic and environmental benefits that come from that.

[The prepared statement of Mr. Walden follows:]

PREPARED STATEMENT OF HON. GREG WALDEN

Good afternoon, and welcome to today's hearing on the shifting geopolitics of oil and gas. We have an excellent lineup of witnesses and a lot to discuss.

This is a big week in Washington, DC, as we host the World Gas Conference, which convenes every 3 years in a different city across the globe. The conference brings together hundreds of participants—energy ministers and CEOs from global energy companies—to discuss strategic, commercial, and technical issues facing the industry. It's been 30 years since the conference was held in the United States, and we're honored to host it again this year.

It's interesting to reflect on the last 30 years, and especially the last decade, to truly appreciate how our energy security situation has improved. By almost every measure, we're more energy secure today than ever before.

Today, the United States is the world's number one producer of petroleum and natural gas. Our markets are more open, transparent, and competitive than ever before. Prices for consumers are low and stable. We've cut our imports by about 75 percent since they peaked in 2005, and if this trend continues, we'll be net energy exporters in just a few short years.

We got here by repealing the Carter-era supply and price controls to encourage a free market for energy commodities. We've taken steps to improve our regulatory policies and reform our outdated tax code to encourage domestic production. And piece-by-piece, we've removed restrictions on energy trade to allow American energy to compete in the global marketplace. Most recently, as Members on this committee will remember, we repealed the 40-year ban on crude oil exports. Now, just 2 years later, we're exporting more than one-and-a-half million barrels per day of crude oil to countries around the world.

The shale revolution, now 10 years in the making, has had an enormously positive impact on our economy. It's created hundreds of thousands of jobs and billions of dollars in investments that wouldn't have happened were it not for our energy abundance. The jobs and investments are widespread throughout all sectors of the economy and across all 50 States.

It's also had a big impact on our power sector, and with the shift to abundant and cheap natural gas, we've seen a huge reduction in our carbon emissions.

In fact, the U.S. is leading the world in reducing carbon emissions by a large margin. Since peaking in 2005, our carbon emissions have declined steadily and this trend looks likely to continue. This just goes to show that we don't need Government mandates to reduce emissions. We can get much better results when we allow the private sector to innovate, develop new technologies, and improve efficiency.

We're seeing these benefits today—and as we emerge as a world leading LNG exporter, our trading partners will share in this good fortune.

The outlook for American energy is bright. With plentiful reserves, a highly skilled workforce, and pro-growth regulations, our energy production will continue to grow. And with this growth, America will see even greater economic, geopolitical, and environmental benefits, along with additional opportunities to help our American allies abroad who are in need of reliable and affordable supplies of energy.

I'd like to thank the witnesses for appearing before us today to share their experiences and provide suggestions on ways to lock-in future production growth, jobs, and economic benefits for years to come.

Thank you, I yield back.

Mr. WALDEN. With that, I've got a minute and a half left. If anybody on our side wants to use that, I'd be happy to yield.

Mr. Barton, former chairman of the committee, the vice chair of the full committee, I would yield such time as you may use.

Mr. BARTON. Thank you, Mr. Chairman. I, basically, just want to welcome the panel. I know three of you personally and the fourth one I am sure I'd love to know personally if I did.

So our committee, in the time I've been on it, starting back when John Dingell was chairman, has led the Congress in energy legislation, and we have gone from where in the '70s and early '80s we were trying to restrict the use of things like natural gas and put price controls on various things and our natural resources because we thought that we were entering an era of scarcity to the point where we are now in an—I won't say an era of surplus, but in an era where we are on the verge of being the dominant energy producer in the world and, you know, I think that's a good thing, and you gentlemen have helped lead that effort.

Of course, Mr. Yergin, he's probably the premier—I won't say statistician or historian, but he's certainly one of the leading experts in the world. So we are glad to have you especially, sir.

And with that, Mr. Chairman, I yield back my 2 seconds.

Mr. WALDEN. I yield back.

Mr. UPTON. Time is expired. The Chair would recognize the ranking member of the full committee, Mr. Pallone from New Jersey, for an opening statement.

OPENING STATEMENT OF HON. FRANK PALLONE, JR., A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW JERSEY

Mr. PALLONE. Thank you, Mr. Chairman. After nearly 2 years of Republican control of all branches of Government, my Republican colleagues have little to show for their efforts, and the little they have accomplished is benefitting the wealthy to the detriment of the middle class and the vulnerable.

Just think about it—skyrocketing health care premiums and growing numbers of the uninsured, a widely unpopular Trump tax scam, trillions of dollars in new and mounting debt, and now a devastating Trump-inflicted policy that stripped thousands of children from their parents.

So faced with the failure of their policies, Republicans have started to retreat to their safe spaces, including proposing draconian cuts to Medicare, Medicaid, and Social Security as part of their new budget and now, of course, today's old favorite—cheerleading for fossil fuels.

The latest version of this tired old story has Republicans going so far as to trying to legislatively blackmail States like New Jersey that have stood up to the administration's oil-above-all agenda, by imposing sizeable fees on any State that refuses to rubber stamp President Trump's offshore drilling expansion policy.

Early this year, New Jersey Governor Phil Murphy listened to our coastal communities and blocked offshore oil and gas drilling in State waters.

The Jersey shore where I live is a priceless national treasure that is an engine for our tourism industry that generates \$38 billion a year and one of the largest recreational fishing industries in the Nation.

That's all threatened by offshore drilling, which will destroy our coastal economy. We simply don't need to risk the health and vitality of our coastal communities for the sake of putting more fossil fuels into our energy mix.

We have seen this show before. First, rising gasoline costs or something else moves us toward reducing our dependence on fossil fuels. Then, in response, fossil fuel industry executives come to Congress to tell us that the only solution to our problems is to ramp up drilling and decrease restrictions on their industry in order to increase supply.

That's happening today, as reckless Republican policies have led to a significant jump in the price of gasoline since March. In fact, the price of gas has gone up nearly 25 percent since President Trump took office.

You'd think that would lead to an effort to support cleaner less gas-guzzling vehicles. But that logic is lost on President Trump and his ethically challenged EPA administrator, Scott Pruitt, who have gone completely in the opposite direction.

They have moved aggressively against clean cars and a diverse 21st century energy policy. Instead, President Trump has worked tirelessly to put in place a 1950s approach to energy that only an oil company could love and can best be summed up by the words dig, drill anytime, anywhere, even if it's in our coastal recreational waters.

Now, President Trump also made a foolish decision by announcing his intention to withdraw from the Paris Climate agreement. That was an agreement we spent years negotiating with the global community and was signed by, roughly, 200 countries.

By abandoning our friend and allies, we have ceded our leadership on climate action and clean technology development and deployment to China, and others.

We were the global leader, but now we don't even have a seat at the table. What does that mean? That puts America last and is, tragically, shortsighted.

Republican "oil-above-all" policies have always centered on one thing—putting the profits of oil tycoons and fossil industry donors first, and the current rerun of this clichéd show should have been canceled long ago. But, obviously, it isn't.

[The prepared statement of Mr. Pallone follows:]

PREPARED STATEMENT OF HON. FRANK PALLONE, JR.

After nearly 2 years of Republican control of all branches of Government, my Republican colleagues have little to show for their efforts. And the little they have accomplished is benefiting the wealthy to the detriment of the middle class and the vulnerable. Just think about it: skyrocketing health care premiums and growing numbers of the uninsured, a wildly unpopular Trump Tax Scam, trillions of dollars in new and mounting debt, and now a devastating Trump inflicted policy that stripped thousands of children from their parents.

So, faced with the failure of their policies, Republicans have started to retreat to their "safe spaces," including proposing draconian cuts to Medicare, Medicaid and Social Security as part of their new budget and, of course, today's old favorite: cheerleading for fossil fuels.

The latest version of this tired old story has Republicans going so far as trying to legislatively blackmail States that have stood up to the administration's oil-above-all agenda by imposing sizable fees on any State that refuses to rubber stamp President Trump's offshore drilling expansion plan. Earlier this year New Jersey Governor Phil Murphy listened to our coastal communities and blocked offshore oil and gas drilling in State waters. The Jersey Shore is a priceless national treasure that is an engine for a tourism industry that generates \$38 billion a year, and one of the largest recreational fishing industries in the Nation.

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That's happening today as reckless Republican policies have led to a significant jump in the price of gasoline since March. In fact, the price of gasoline has gone up nearly 25 percent since President Trump took office. You would think that would lead to an effort to support cleaner, less gas guzzling vehicles. But, that logic is lost on President Trump and his ethically challenged EPA Administrator, Scott Pruitt, who have gone completely in the opposite direction. They have moved aggressively against clean cars and a diverse 21st century energy policy. Instead, President Trump has worked tirelessly to put in place a 1950s approach to energy that only an oil company could love, and can best be summed up by the words "dig, drill, anytime, anywhere" even if it's in our coastal recreational waters. President Trump also made a foolish decision by announcing his intention to withdraw the United States from the Paris Climate Agreement. This was an agreement we spent years negotiating with the global community, and was signed by roughly 200 countries. By abandoning our friends and allies, we have ceded our leadership on climate action and clean technology development and deployment to China and others. We were the global leader, but now we don't even have a seat at the table. That puts America Last, and is tragically shortsighted.

Republican Oil-Above-All policies have always centered on one thing: putting the profits of oil tycoons and fossil industry donors first. The current re-run of this clichéd show should have been canceled long ago.

I yield back.

Mr. PALLONE. I don't know if anyone else would like my time. If not, I will yield back, Mr. Chairman.

Mr. UPTON. I'd like to say the gentleman's time has expired, but I'll be polite.

[Laughter.]

The gentleman yields back.

So we are ready for the testimony. I appreciate all of you sending up your testimony in advance. I was able to read it last night.

It will be made part of the record in its entirety, and you'll each have 5 minutes to summarize that testimony and expound how you might, and we will do questions.

And Dr. Yergin, you're first up.

Thank you. You got to hit that button to make sure that you're on.

STATEMENTS OF DANIEL YERGIN, PH.D., VICE CHAIRMAN, IHS MARKIT; DENNIS V. ARRIOLA, CHIEF STRATEGY OFFICER, EXECUTIVE VICE PRESIDENT OF EXTERNAL AFFAIRS AND SOUTH AMERICA, SEMPRA ENERGY; KEVIN KENNEDY, PH.D., DEPUTY DIRECTOR, U.S. CLIMATE INITIATIVE, WORLD RESOURCES INSTITUTE; AND HAROLD HAMM, CHAIRMAN AND CHIEF EXECUTIVE OFFICER, CONTINENTAL RESOURCES

STATEMENT OF DANIEL YERGIN

Dr. YERGIN. Mr. Chairman, Acting Ranking Member, members of the subcommittee, it's really an honor to be here and to have the chance to talk about this just dramatic change that's happened in the United States and what it means for our economy, for geopolitics, and the position of the United States in the world.

As the chairman pointed out and Mr. Walden pointed out, the World Gas Conference is here. It's 12,000 people from around the world who have come to Washington.

I have just come over from it. The theme of this conferences is fueling the future and now it's a very different future because of the shale revolution in the United States, and that has been one of the major themes.

This is, as was noted, the 10th anniversary, at least as we see it at IHS Markit, of what we have called the shale gale, which was—really changed the United States and the energy picture to have profound consequences, although I think the scale of the consequences would have been foreseen.

What's changed since 2008? Well, back in 2008, we were going to be the largest importer of LNG in the world. Now we are on the road to be one of the largest exporters and, indeed, as noted, the largest producer of natural gas in the world.

As many of you know, for four decades energy independence was the cry but we always were going in the other direction. The question only seemed to be how high would our imports go.

But now in a decade, we have gone from importing on a net basis 60 percent of our oil to 16 percent. Huge change.

Everyone knows that trade is a very big issue, so it's noteworthy to observe that over this decade the change in the U.S. oil position, along with changes in prices, has reduced the Nation's annual trade deficit by \$300 billion.

U.S. oil production has more than doubled in the decade, and here's something striking. Next year, or maybe later this year, the United States will become the world's largest oil producer, ahead of Saudi Arabia and Russia.

It's been a major stimulus to the U.S. economy, not just in the oil and gas sector, but because across the entire economy because of long supply chains, and I would say in many States that—where shale is not permitted there are jobs that have been created, we calculated 50,000 jobs in the State of New York because of the shale revolution.

Industries that were supposed to flee the United States because of high energy costs are now here in the United States, spending tens of billions of dollars.

Also, this is having major geopolitical impacts that are constructive for the United States. I can see it as I travel around the world how there is a whole new degree of influence that the United States has because of this revolution.

The turnaround in gas is just striking. The 8-year period of 2000–2007, total U.S. gas production grew by 1 percent. Over the subsequent 10-year period it's grown by 40 percent, and we believe that it will grow by another 60 percent over the next 20 years.

So where would we be without this? Without the shale revolution, the United States would be importing large volumes of oil and gas. Our trade balance would be dramatically different.

Millions of jobs would not exist and the United States would be less competitive. The domestic U.S. power markets and the overall economy would look significantly different without the shale revolution.

Similarly, the outlook would be different in terms of the global economy and international relations both for countries that produce oil and gas and for countries that import them.

I just came from a meeting of APEC countries and the role of the U.S. in terms of LNG is something that is now very important to those Asian countries.

Certainly, without the shale gale we would be in a different position internationally. This has brought a new element of influence and independence for the United States. It was so evident this morning, and U.S. LNG exports are becoming a significant and positive factor in relations with many countries and a key issue in discussions about trade.

So this new outlook for oil and natural gas has created new possibilities for making progress towards national goals of energy efficiency, cost efficiency, environmental protection, global competitiveness, and energy security.

It is also contributing jobs and revenues to the economy at the national, State, and local levels. In short, the shale gale has put a powerful new wind at America's back.

Thank you.

[The prepared statement of Dr. Yergin follows:]

“The Shifting Geopolitics of Oil and Gas”

Hearings

Subcommittee on Energy

Committee on Energy and Commerce

United States House of Representatives

115th Congress

Testimony on the Impact of U.S. Shale Revolution

Submitted by

Dr. Daniel Yergin

Vice Chairman IHS Markit

June 26, 2018

Mr. Chairman, Ranking Member, Members of the Subcommittee,

Thank you for the invitation to address this Subcommittee. It is an honor to come before you to discuss the dramatic changes in the energy position of the United States resulting from the unconventional revolution in oil and natural gas, and the impact these changes are having on the U.S. economy, geopolitics, and the position of the United States in the world.

This hearing is timely, of course, because it occurs during the World Gas Conference, an event that happens only once in three years, that moves around the world, but that is being held appropriately enough this year just a few blocks from here in Washington D.C. This year's location highlights the world class impact of changes in natural gas in the United States and the new position of leadership that these changes are providing for the United States. The theme of the conference this year is "Fueling the Future", and now it is a very different future because of the shale revolution in the United States.

What also makes these hearings particularly timely is that this is the tenth anniversary of what IHS Markit called, some years ago, the "Shale Gale". It was in the period, a decade ago, around 2008 that it became apparent that something significant was changing in the U.S. energy picture and that it would have profound consequences – although the scale of the consequences could not be foreseen.¹

Major Changes

What has changed since 2008? In terms of natural gas, a country that was thought to be on the road to being the largest importer of natural gas is now on the road to being one of the major exporters of natural gas and indeed is the largest producer of natural gas in the world.

As for oil, political leaders had for four decades invoked "energy independence" as a national goal, meaning reducing oil imports. But that did not match the reality. The question only seemed to be how much higher would oil imports go as a share of total oil consumption. But, in a decade, we have gone from importing 60% of our oil down to just 16 %, on a net basis. We all recognize that there is major focus on the trade balance at this time. Thus is it noteworthy to observe that over the decade, the change in the U.S. oil position (along with changes in price) has reduced the nation's annual trade deficit by over \$300 billion.² U.S. oil production has more

¹ This paper draws on the new IHS Markit report, *The Shale Gale Turns 10: A Powerful Wind at America's Back – What's Ahead for the Next Decade?*, by Samuel Andrus and Daniel Yergin

² *Monthly Energy Review*, May 2018, Table 1.5

than doubled in a decade, and in the next year the United States will likely become the world's largest oil producer, ahead of Saudi Arabia and Russia.

The shale revolution has been a major stimulus to the U.S. economy – not just in the oil and gas sector but across the entire economy because of the long supply chains. Industries that were expected to flee the United States because of high cost energy are now spending tens of billions to build new plants in the United States because of the availability and moderate cost of energy. Consumers have benefitted from the same availability and moderate costs, including in terms of electricity.

This revolution is having major geopolitical impacts that are constructive for the United States. It has introduced new positive dimensions in U.S. relations with many countries and provided the United States with new kind of influence.

Yet it was not obvious that such a revolution would ever take place. The development of the technology took decades and in some ways began with professional studies in the early 1980s. It was not until the period 1998-2003 that combining two technologies – horizontal drilling and hydraulic fracturing – enabled unlocking on an economic basis of resources heretofore thought permanently trapped in geological formations. While some, including one of your other witnesses today, were pursuing these technologies, it was considered rather fringe, something limited to some “independents”. In the mid 2000s, literally dozens of projects were being developed to import liquefied natural gas (LNG) on the premise that the United States was entering an era of permanent shortage of gas. At the same time, there was great fear that the United States was dangerously vulnerable because of ever-higher oil imports.

But the signs that this revolution in production might have wider impact emerged in 2008 when it was noticed that U.S. natural gas production was going up, not down. A few years later, it became clear that U.S. oil production was increasing, not declining – the result of the application of these same technologies.

40% Growth in Natural Gas Output

The turnaround in natural gas production has been striking. For the eight-year period of 2000–07, total US natural gas production grew less than 1%. However, over the subsequent 10-year period of 2007–17, output grew by 40%, while prices went down. And the pace of growth is accelerating. For 2018, we expect natural gas production to be up 7 billion cubic feet per day (Bcf/d) relative to 2017. Altogether, we anticipate that US production could grow by another 60% over the next 20 years.

The Potential Gas Committee has estimated that US recoverable resources have increased by 70%, from 2,074 trillion cubic feet (Tcf) in 2008 to 3,141 Tcf in 2016, and those numbers will likely increase as hydraulic fracturing technology improves and more associated gas gets added to the ledger. Our current view, as of 2018, is that there is approximately 1,250 Tcf of resource that is economic below \$4/MMBtu. In recognition of the change, as early as 2012, President Barack Obama stated: “We have a supply of natural gas that can last America nearly 100 years.” He added: “The development of natural gas will create jobs and power trucks and factories that

are cleaner and cheaper, proving that we don't have to choose between our environment and our economy."³

With broad recognition of resource availability, supplies grew, and prices declined. What had been expected to become an increasingly scarce and expensive resource was now abundant and inexpensive. Between 2007 and 2017, US natural gas production grew from 51.7 Bcf/d to 72.6 Bcf/d. Gas's share of total US energy consumption rose from 22% in 2006 to 29% in 2017.

Impact on Electric Power

The impact of the Shale Gale on the domestic electric power industry has been particularly dramatic.

Prior to 1990, coal and nuclear dominated the growth in share of US electric power generation capacity and energy. Coal was inexpensive and regarded as a secure domestic energy source. The start-up of nuclear power plants was the result of investment decisions largely made in the 1970s. Owing to the natural gas shortages of the late 1970s, the use of natural gas was banned in new electric generation. That ban was lifted in 1987. But coal still dispatched ahead of natural gas and limited gas' share of domestic electric generation.

The shale gas revolution has transformed power generation economics in the United States, resulting in a rebalancing in fuel choice for electric generation. In 2007, coal provided 52% of US generation and natural gas provided 17%, and more than 10 gigawatts of coal generation was under construction. In 2016, natural gas overtook coal for the first time and supplied 33% of total electric generation while coal supplied 31%. A rivalry has developed between coal and natural gas, with the competitive advantage moving back and forth depending on relative prices. It is clear that gas has become, and will continue to be for the foreseeable future, a backbone of electric generation in the United States.

The shift from coal to natural gas has, because of falling natural gas prices and confidence in long-term gas supply, along with the addition of renewables, contributed to the reduction in US carbon dioxide (CO₂) emissions from power generation. We estimate that in 2017, CO₂ emissions from power generation were down 30% from 2005. More than half of that emission decline was from gas replacing coal.

Geographic Shift – the Marcellus, Utica and Permian

Prior to 2007, US natural gas production was predominantly from the Southwest and the Gulf of Mexico. Canadian imports accounted for about 16% of US consumption. Since producers first learned how to frack the shale source rock, there has been a continuous evolution in terms of new and prolific discoveries.

³ State of the Union Address, January 24, 2012.

Appalachia's vast economic resource base comprises the massive and prolific Marcellus and Utica plays, each of which is now estimated to be able to supply the United States with two decades of natural gas. The Marcellus extends from Pennsylvania, West Virginia, and Ohio into Maryland and New York State, although shale gas development is prohibited in the last two states. Much of the Utica lies beneath the Marcellus. Production from these plays, currently at 24 Bcf/d, is expected to grow to almost 50 Bcf/d by 2050—rivaling the entire US production level prior to the Shale Gale. But this monumental growth will require more infrastructure to move gas production from supply basins to consuming markets within North America and to LNG terminals for export.

And now there is another new player, the Permian Basin in West Texas, which is the predominant source of growing shale oil and “associated gas” (gas that is produced with oil). This growing Texas oil production has helped boost the contribution of total associated gas to almost 30% of total US production. More than 8 Bcf/d of new pipeline capacity has been proposed to move this growing supply of Permian gas to market. However, the first 2 Bcf/d of expansion is not expected online until late 2019. It is likely that a significant portion of that gas will go to new industrial facilities on the Gulf Coast and to exports (of LNG and by pipeline to Mexico). The pace of growth in the Permian Basin, much like the Marcellus before it, is outstripping the pace of infrastructure expansion.

An unprecedented amount of incremental pipeline capacity (exceeding 30 Bcf/d) has been developed or proposed to connect supply from Appalachia and West Texas to growth markets throughout North America. The timely development of that infrastructure will be very important to capturing the full value of this new resource base. This wealth of economic resource has led to the price of natural gas falling below \$3/MMBtu. One major consequence is that gas at lower prices has turned around the prospects for energy-intensive manufacturing in the United States – and the jobs that go with it.

Making U.S. Manufacturing Competitive

For years, energy-intensive manufacturing had been leaving the United States owing to high energy costs. But, as the reality of abundant and inexpensive natural gas came to be accepted, the direction of investment changed. The advantages in terms of thermal energy, feedstock, and electricity costs have driven a surge of new investment in US petrochemical and other industrial facilities. IHS Markit estimates that, from 2010 through 2020, more than \$120 billion in new capital investments will be spent to expand petrochemical manufacturing capacity. Ancillary expenditures around the plant projects could easily double the total capital investment.

The economic benefits have not been limited to capital investments. Lower prices for raw materials and energy have increased industrial production. The United States has become competitive in energy-intensive products. It has been estimated that, by 2025, as many as four million jobs—direct, indirect, and induced—could be supported by unconventional activity.⁴

⁴ See the IHS Markit study *America's New Energy Future: The Unconventional Oil and Gas Revolution and the U.S. Economy, Vol.3: A Manufacturing Renaissance*, 2014.

The Big Flip: from Imports to Exports of Natural Gas

As already noted, the informed assumption prior to 2007-8 was that the United States was going to be a major importer of LNG, perhaps the world's largest. On that basis, construction had already begun on facilities for importing LNG, regasifying it, and distributing it to US consumers.

But then, as the Shale Gale's intensity grew, it became obvious that higher-cost imported LNG would have no market in the United States. Not only were LNG imports not required, but US pipeline imports of natural gas from Canada declined from a peak of about 16% of domestic supply in 2005 to about 7% currently. Moreover, and contrary to what had seemed settled wisdom, it became clear that the growing volumes of gas were exceeding domestic demand and that the United States could sell natural gas into international markets while still easily meeting its own growing demand.

By the beginning of 2018, the United States was exporting 4.4 Bcf/d (worth about \$5 billion per year) via new pipelines to Mexico—about 6% of domestic production but close to half of Mexican natural gas needs. For Mexico, this was the most immediate and tangible benefit of its own domestic energy reforms, because imported gas from the United States used in electric generation helped to bring down the cost of electricity for Mexican consumers, manufacturers, and voters.

In addition to Mexico, there is the growing global market. The dramatic expansion in US natural gas production has meant a 180-degree turn, enabling the United States to become an LNG exporter, rather than an LNG importer. Plants that were originally envisioned as LNG receiving terminals have been reconfigured as LNG liquefaction export terminals, at the cost of tens of billions of dollars. New greenfield projects have also been initiated. Some energy-intensive manufacturing companies expressed concerns about exporting LNG, fearing that this could crimp supplies for their own multibillion-dollar investment commitments. However, the continued growth in natural gas production allayed those fears.

One small export terminal in Alaska had, since 1969, exported limited volumes of LNG. But the first new major US LNG export terminal dispatched its first cargo in February 2016. Since then, up to 3 Bcf/d of US LNG has been delivered to a total of 26 countries: Argentina, Brazil, Chile, Malta, China, the Dominican Republic, Egypt, India, Italy, Japan, Jordan, Kuwait, Lithuania, Mexico, Portugal, South Korea, Spain, the Netherlands, Pakistan, Poland, Taiwan, Thailand, the United Arab Emirates, Britain, Turkey, and Colombia.

We expect that, over the next five years, the current 3.1 Bcf/d of LNG export capacity will grow by another 6.9 Bcf/d. Investment in these plants will total an estimated \$56 billion. Instead of being a gas-short LNG importer, the United States is now on track to rank among the world's major LNG exporters. By 2025, the global LNG market is anticipated to be more than 400 million metric tons per year, with the top suppliers—Qatar, Australia, and the United States—exporting 60% of total supply.

Oil -- U.S. to Become World's Largest Crude Oil Producer

The Shale Gale may have begun with natural gas, but the shale revolution would be extended to oil, with enormous global impact. In the first several years of shale gas development, there had been skepticism about the applicability of the technology to oil. But around 2008-2009, that applicability came to be understood. Around 2012, U.S. oil production began to demonstrate the same kind of surge that had characterized natural gas. Between 2008 and 2018, US crude oil output more than doubled – going from 5 million barrels a day to almost 11 million barrels per day. Output has exceeded the previous high set in 1970. It is set to continue rising, and sometime over the next year will reach a level that makes the United States the world's largest crude oil producer, ahead of Saudi Arabia and Russia. On a net basis, the United States went from importing 60% of its liquid fuel at the peak to below 16% in March 2018, which is a level last seen in the late 1950s.

The rise in Texas is particularly striking. In 2008, Texas had produced approximately 1 million barrels per day. By 2018, it is producing close to 4 million barrels per day. The Permian basin in Texas and New Mexico is now one of the world's great centers for oil production. In the past 24 months, production from just this one region has grown far more than any other entire country in the world. Permian output in 2008 was 900,000 barrels per day. Last year it was 2.5 million barrels per day. IHS Markit projects that it will more than double, reaching 5.4 million barrels per day by 2023 – meaning that this one region in the United States will be producing more oil than every country in OPEC, except for Saudi Arabia.⁵

One other notable consequence of this growth: Owing to the mismatch between the typical quality of shale oil and America's existing refining capacity, the United States has become a significant exporter of oil (both crude oil and refined products), as well as an importer.

Overall Economic Benefits

The overall economic impacts of shale gas and shale oil have been very large. In February 2014, shortly after leaving the chairmanship of the Federal Reserve, Ben Bernanke said of the shale revolution, "It's clearly been one of the most beneficial—if not the most beneficial—developments" since the 2008 financial crisis and the onset of the Great Recession and "it's helping our economy in a number of ways."⁶

In 2014, IHS Markit estimated that the full unconventional value chain (from upstream energy through energy-related chemicals) associated with unconventional oil and natural gas development had supported more than two million jobs (direct, indirect, and induced), had generated over \$75 billion in federal and state tax revenues, and had contributed more than \$283 billion to US GDP, representing an increase in real GDP for 2012–14 in the range of 2–3%. Per average household, disposable income was raised by more than \$1,000. Notably, the supply chains extended across the country, stimulating manufacturing (notably in the Midwest) and

⁵ See IHS Markit Report, *The Permian: \$308 Billion, 41,000 wells, and Other Key Ingredients in the IHS Markit Outlook to 2023*.

⁶ Comments by Hon. Ben Bernanke at CERAWEEK Conference, 2014.

service and technological industries across the United States. The development of the Marcellus play provided major economic stimulus in Pennsylvania, including such support industries as real estate, lodging, food, vehicle sales, construction, and local commerce. The Shale Gale was even creating jobs in New York State, despite that state's ban on shale gas development. At the peak, shale was responsible for about 15% of all the capital investment in the fixed equipment and structures sector for the United States.

The oil price collapse that began in late 2014 led to a dramatic cut in investment. However, prices have rebounded. US capital investment is once again increasing, and producers have increased well productivity and reduced costs. Indeed, the only place in the world where E&P investment is significantly rising is in the United States. Such expenditures are stagnant in the rest of the world.

Wide-ranging Impacts

Without the shale revolution, the United States would be importing large volumes of oil and gas, our trade balance would be dramatically different, millions of jobs would not exist, and the United States would be less competitive. The domestic US power markets and overall economy would look significantly different without the shale revolution. Similarly, the outlook would be different in terms of the global economy and international relations—both for countries that produce oil and natural gas and for countries that import them.

Certainly, without the Shale Gale, the United States would be in a very different position internationally. The Shale Gale and its consequent impact on oil have brought new elements of influence and independence for the United States. US LNG exports are becoming a significant and positive factor in the relations with many countries and a key element in discussions about trade.

The new outlook for oil and natural gas has created new possibilities for making progress toward national goals of energy efficiency, cost efficiency, environmental protection, global competitiveness, and energy security. It is also contributing jobs and revenues to the economy at the national, state, and local levels. In short, the Shale Gale has put a powerful new wind at America's back.

Mr. UPTON. Thank you. Mr. Arriola.

STATEMENT OF DENNIS ARRIOLA

Mr. ARRIOLA. Mr. Chairman—Chairman Upton, Acting Ranking Member McNerney, and members of the subcommittee, thank you for this opportunity to testify regarding U.S. natural gas policy and how it affects our business.

My name is Dennis Arriola and I am the chief strategy officer for Sempra Energy and I also have responsibility for our external affairs in our South American operations.

Sempra, as you mentioned, is a Fortune 500 services company based in San Diego, California, and we have approximately 20,000 employees that serve more than 40,000 consumers around the world and we are the largest utility holding company with the largest U.S. customer base.

And our utilities include Southern California Gas Company, which is the largest natural gas distribution company in the United States, San Diego Gas and Electric, and Encore Electric Delivery Company in Texas.

And our energy infrastructure companies include our investments in Mexico that help import U.S. natural gas and petroleum products to that country and we have also have our Sempra LNG and Midstream business.

And as Dr. Yergin mentioned, the timing of this hearing couldn't be better as the World Gas Conference is here in our Nation's Capital, and with the global triennial next stopping in the Republic of Korea and China, the conference this week in DC is the last time that the U.S. is going to have the opportunity to really help shape the discussion as the host country for years to come.

And I can tell you that the world truly is watching what's going on in Washington this week. The outlook for domestic and international natural gas markets has never been better because of two key developments, and one which Dr. Yergin mentioned—the shale energy boom—but also the opportunity to export U.S. liquefied natural gas, or LNG.

And if we invest wisely and follow smart pro-market policies, there's little doubt that the U.S. will derive increased economic benefits, job growth, and even greater energy independence, and natural gas now serves as the leading fuel source for the industrial, commercial, and residential sectors of the U.S. economy.

And this increased consumption is providing for significant job growth, boosting the economy, and lowering air emissions, and natural gas is also ensuring greater energy security and prosperity globally as well.

Now, we own two and operate two LNG facilities and we are in the process of permitting a third. Our Cameron LNG is in Louisiana—is under construction. We currently have 10,000 workers on site and when it's completed and starts operating in 2019, the facility is going to create approximately 130 well-paying jobs in an area that really will benefit from them.

We are also pursuing our FERC permit for an LNG export facility located near Port Arthur, Texas, and again, this is going to be employing over 3,100 construction and engineering jobs and, on av-

erage over the 4- to 5-year period of build out it's going to create more than 200 permanent well-paying jobs.

Both of these projects together could help reduce our overall trade deficit by, roughly, \$16 billion annually, and these and other export facilities are going to promote new pipelines and maintain natural gas production for many States that are represented here on the subcommittee, including Ohio, Pennsylvania, New Mexico, Texas, and Louisiana, and it's also going to help continue the current cost advantage that benefits U.S. consumers.

Now, we have the potential to strengthen alliances with developed and developing countries by providing a safe and reliable resource to those countries.

But we've got to be able to build the infrastructure in this country to do that, and the U.S. gas exports can also help our European and Asian allies reduce their energy dependence on Russia.

And if we are to benefit from this opportunity, we've got to take advantage of it and the time is now, and one of the things that we were looking for from this subcommittee is to, along with the administration, figure out how we can expedite in a smart manner the permitting processes that are required here in this country to have that infrastructure, to help export good clean natural gas from the United States.

These delays jeopardize commercial agreements with our international trading partners and you can be sure that the other major LNG-exporting countries are doing everything possible to enhance their competitive position, and bureaucratic delays are not one of the challenges they have.

So I think we need to work together as a country to take advantage of this window of opportunity to make sure that when you enter into these contracts these are 20- to 30-year contracts.

If we, as an American business community, can't get in on time with these countries, we are going to get shut out and we are not just shut out for a year—we are shut out for decades, and that means that the jobs that can be helping certain parts of our country, the economic progress won't come about.

And so what we need is to ensure that FERC maintains its typical permit review schedule of no more than 18 to 24 months so that we can get this going.

Thank you.

[The prepared statement of Mr. Arriola follows:]

**Opening Remarks
Dennis V. Arriola
Chief Strategy Officer
Executive Vice President of External Affairs & South America
Sempra Energy
Committee on Energy & Commerce
Subcommittee on Energy
June 26, 2018
Hearing on The Shifting Geopolitics of Oil & Gas**

Chairman Upton, Ranking Member Rush, and members of the Subcommittee, thank you for this opportunity to testify regarding U.S. natural gas policy and how it affects our business. My name is Dennis Arriola, and I am Chief Strategy Officer and Executive Vice President of External Affairs and South America for Sempra Energy. In my testimony, I offer Sempra's perspective on the benefits of natural gas to the domestic economy as well as the opportunities for U.S. liquified natural gas -- or LNG -- to capture global export markets. I also offer our perspective on some of the challenges we face and suggestions on how U.S. policymakers might be able to help address those challenges.

Sempra Energy is a Fortune 500 energy services holding company based in San Diego, with revenues of more than \$11 billion in 2017. The Sempra Energy companies' approximately 20,000 employees serve more than 40 million consumers worldwide and we are the utility holding company with the largest U.S. customer base. Sempra Energy operates electric and natural gas distribution utilities and also develops energy infrastructure.

Our utilities include Southern California Gas Company (SoCalGas), the largest natural gas distribution company in the U.S., San Diego Gas & Electric (SDG&E) in Southern California, Oncor Electric Delivery Company (Oncor) in Texas and two electric utilities in South America.

Our energy infrastructure businesses include our investments in Mexico that help import U.S. natural gas and petroleum products to that country and Sempra LNG & Midstream. Sempra LNG & Midstream owns LNG facilities, midstream natural gas infrastructure and natural gas storage. We are an experienced LNG developer and operator with facilities in both Louisiana (Cameron LNG) and Baja California, Mexico. Additionally, we are seeking to develop an additional LNG export facility in Port Arthur, Texas (Port Arthur LNG).

The U.S. Natural Gas Advantage

This hearing could not be timelier, as the World Gas Conference is being held here in Washington, D.C., this week. The U.S. has not hosted the World Gas Conference in three decades. It is the first time that the conference will be held in a country that is both the largest producer and consumer of natural gas. With next stops in the Republic of Korea and China, this is the last time for years to come that the U.S. has the opportunity to shape the discussion as the host country. And the world is watching.

As a result of two key developments -- the U.S. shale energy boom and the growth in U.S. LNG export opportunities -- the outlook for domestic and international natural gas markets has never been better. If we invest wisely and follow smart, pro-market policies, there is little doubt that the U.S. economy will be the big beneficiary with job growth and even greater energy independence.

Advances in technology for extracting gas have resulted in an abundance of affordable energy here in the U.S. The Potential Gas Committee (PGC) recently released its latest biennial assessment of the nation's natural gas resources, which indicated that the U.S. possesses a total technically recoverable resource base of 2,817 trillion cubic feet (TCF) as of year-end 2016, or supplies that will last more than 90 years at current extraction levels. This is the highest resource evaluation in PGC's 52-year history, exceeding the previous high assessment (from 2014) by 302 TCF (increase of 12%).

As a result of this transformative accomplishment, natural gas now serves as the leading fuel source for the industrial, commercial, and residential sectors of the U.S. economy. This increased consumption is providing for significant job growth, bringing back industries to the Gulf Coast that are dependent on reliable and affordable energy, boosting our local and national economies, and lowering air emissions. It is being used increasingly for power generation and assisting in the integration of renewable energy into the electric system, ensuring reliability and resiliency when the sun isn't shining or the wind isn't blowing. When used as a transportation fuel, natural gas reduces fuel costs and helps clean the air. And though transportation-fueling systems require careful planning and investment, these networks have already begun to emerge. The abundance and affordability of natural gas as a transportation fuel is also helping to drive technological investments in engines for heavy-duty trucks.

Natural gas is not only helping bring economic and environmental benefits domestically, but it also is ensuring greater energy security and prosperity globally. Utilizing natural gas will help alleviate energy poverty in developing countries, while helping to reduce emissions by replacing traditional low-grade fuels, such as firewood, animal manure and charcoal for cooking.

The LNG Export Opportunity

This brings me to the possibilities associated with the growth of U.S. LNG exports. As I mentioned earlier, Sempra Energy owns and operates two LNG facilities: Cameron LNG, an import facility in Hackberry, Louisiana, which Sempra decided in 2011 to expand to add natural gas liquefaction and export facilities; and Energía Costa Azul in Baja California, Mexico.

The Cameron LNG export project will be comprised of three liquefaction trains, three storage tanks, two marine berths for the largest LNG ships, and related infrastructure. Construction on the project began in October 2014, with commercial operations expected to begin early next year. We currently have over 10,000 workers on site. As reflected in our 2012 FERC application for the project, the total economic impact in the U.S. from Cameron LNG is estimated to be \$336 billion over the life of the project. The project is expected to generate an average of 53,000 direct and indirect jobs annually during the 20-year operations period, resulting in a total impact during the periods of construction and operation of 1.1 million job-years.

Sempra is also pursuing FERC certificate authority to site, construct and operate an LNG export facility located near Port Arthur, Texas. The Port Arthur LNG project will include interstate pipelines connecting the export facility with major natural gas hubs in Texas and Louisiana. Our consultant, ICF International, estimates the economic impact in the U.S. from this proposed project will be \$287 billion, or slightly over \$11 billion annually, over 25 years. Vice Chairman Olson and Congressmen Barton, Green and Flores, you also may be interested to know that this includes a \$1.85 billion annual and \$46.3 billion cumulative positive impacts on the Texas economy.

Additionally, ICF International anticipates that the Port Arthur LNG Project will help facilitate an average of nearly 5,700 direct and indirect jobs in Texas and 41,000 nationally through 2043, resulting in a cumulative impact of over 143,000 job-years for the state of Texas and one million job-years for the U.S. economy.

The growth of U.S. LNG exports has the potential to strengthen U.S. foreign policy and improve our balance of trade. While an abundance of U.S. natural gas is leading to a manufacturing resurgence in the U.S., it also has the potential to strengthen alliances with developed and developing countries by providing a stable, affordable, flexible, and reliable source of energy that gives those countries the certainty they need to build their energy infrastructure. U.S. natural gas exports also can help our European allies reduce their energy dependence on Russia. Finally, U.S. LNG exports can help countries improve air quality and the environment by displacing less clean resources.

Exports from Cameron LNG and Port Arthur LNG will reduce the U.S. trade deficit could help reduce our overall trade deficit by roughly \$16 billion annually, and generate a combined cumulative value of approximately \$303 to \$402 billion over the life of these projects. These and other U.S. export facilities will promote new pipelines and maintain natural gas production in the many producing states (e.g., Ohio, Pennsylvania, New Mexico, Texas and Louisiana); and at levels that will continue the current cost advantage that benefits U.S. consumers.

The Challenges We Face

But, if we are to benefit from this opportunity, we need to ensure we are working together to promote LNG internationally and are not impeding the development of these projects domestically.

Internationally, the federal government should continue to promote and leverage U.S. LNG exports as part of its trade policy with Europe, the Middle East and Asia. In addition to advancing environmental, job creation and global energy security goals, LNG exports also support the Administration's objective of improving the U.S. trade balance, especially with countries that are large importers of LNG and have significant trade surpluses with the U.S., such as Japan, Korea, Taiwan, and China. The Administration could further advance this objective by removing unjustified tariffs on steel and aluminum, which drive up costs and reduce the competitiveness of the energy sector in general and the LNG and pipeline businesses in particular.

Domestically, we are concerned that the length of time it takes to get through the federal permitting process is increasing, not decreasing, contrary to goal of this Administration. It appears that all infrastructure projects at the Federal Energy Regulatory Commission (FERC) are seeing delays due to what we understand are resource constraints at the agency. These delays jeopardize U.S. developers' efforts to consummate large and complicated agreements with international trading partners. There is an abundant worldwide supply of natural gas chasing a finite demand. You can be sure that other major LNG exporting countries, such as Russia, Australia, Qatar and Mozambique, are doing everything possible to enhance their competitive position. If these and other nations provide better certainty of regulatory process than the U.S. does and enable their native companies to get to the market sooner, then they will dominate the market, and the U.S. will lose out. Moreover, the lack of certainty with respect to timing undermines the ability of developers to develop and finance these types of projects. Once our foreign competitors enter into long-term LNG contracts with customers, the window of opportunity for U.S. based projects closes for decades. And that means we would

lose out on the economic and foreign policy benefits to other countries like Russia. We can't let this happen.

We need to ensure that FERC at least keeps to its typical permit review schedule of no more than 18 to 24 months, and that it looks for opportunities to streamline the process even further. Anything longer would be outside of the President's infrastructure permitting goals of a two-year maximum and would have the current Administration's FERC LNG export permitting record trailing that of the Obama Administration.

In addition, there should be certainty resulting from the robust federal permitting process. Specifically, the Department of Energy (DOE) should act on an application by a time certain after FERC's initial order. We would strongly support the thirty-day time limit that Congressman Johnson (R-OH) has proposed in previous legislation considered by this committee. Moreover, we appreciate DOE's recent Policy Statement indicating it does not foresee circumstances where it would invoke its authority to revoke its non-free trade agreement (non-FTA) permits in the future.

As I mentioned at the beginning of my remarks, the World Gas Conference is meeting here in Washington, D.C. this week, with more than 12,000 participants from more than 100 countries. Indeed, the eyes of the world are upon us. Failure of the U.S. to seize the current LNG opportunity has international implications. As the leading producer of natural gas in the world, the U.S. can become one of the world's top LNG exporters by 2022, as forecasted by the Energy Information Administration, achieve the Administration's goal of energy dominance, and promote greater global energy security, but only if we reduce regulatory roadblocks and act with a sense of urgency.

Conclusion

Mr. Chairman and committee members, with the abundance of domestic natural gas, the U.S. can generate good-paying jobs for American workers, provide economic benefits at the local, state and federal levels, work to create a more sustainable and cleaner future, and help reduce energy poverty around the world. These are objectives that benefit all Americans and we shouldn't settle for less. If policymakers can help developers like Sempra to overcome our current challenges, the U.S. is poised to be a global natural gas energy leader for decades to come with many geopolitical benefits.

Thank you for this opportunity to testify, and I look forward to answering your questions.

Mr. UPTON. Thank you. Dr. Kennedy.

STATEMENT OF KEVIN KENNEDY

Dr. KENNEDY. Thank you, Chairman Upton, Mr. McNerney, other members of the committee. I am very pleased to be joining you here today for this hearing.

My name is Kevin Kennedy and I am deputy director for the U.S. Climate Initiative at the World Resources Institute. WRI is a global research organization that turns big ideas into action at the intersection of the environment, economic opportunity, and human wellbeing.

As Mr. McNerney noted, as we look at the energy landscape in the United States today, it's important not just to focus on the oil and gas industry but to consider the broader context of changes that are happening across the country.

America has seen significant progress on the development and deployment of clean energy such as renewables, resulting in large part from the leadership of States, cities, and businesses, often acting with the support and cooperation of the Federal Government.

When President Trump announced last year his intent to withdraw from the international climate agreement, some feared that this progress might slow.

On the contrary, that announcement catalysed continued and expanded commitment from States, cities, and businesses across the country.

Within days, over 1,200 leaders joined together to say we are still in and committed to support climate action, and as of this weekend, that declaration has been supported by over 2,800 leaders.

I have been a core member of the research team behind the America's Pledge Initiative, which was launched last July by former Mayor Michael Bloomberg and Governor Jerry Brown, to document the full range of climate and clean energy actions being taken across America.

Our report last November showed that leaders representing almost half the population and more than half of the U.S. economy have committed to bringing down their greenhouse gas emissions.

These leaders recognized that acting to support clean energy and address climate change can go hand in hand with economic growth and job creation.

While many of those signing declarations like we are still in are doing so for environmental reasons. Others are acting based primarily on the economic opportunities offered by being leaders in clean energy.

They recognize that major countries around the world are investing in renewables and other clean energy sources and the global markets are shifting fast, and they want to see their communities and the country lead rather than to follow.

This committee and Congress can be their partners in moving ahead on renewables, energy efficiency, and other clean energy sources. I want to share just a few of the stories today.

In 2017, large corporate buyers in the U.S. like Google, Kimberly-Clark, and General Motors, announced contracts for nearly 2.9 gigawatts of renewable energy—an 80 percent increase from the previous year, and this year they've already announced deals

for almost 2.5 gigawatts—almost matching last year’s total just 6 months in.

The Republican mayor of Georgetown, Texas, said one of the most important benefits of being 100 percent renewable is the potential for economic development. Many companies are looking to increase their green sources of power for both office and manufacturing facilities.

Mayor Ross added that the city’s move to 100 percent renewables was chiefly a business decision based on cost and price stability.

Looking to energy efficiency, the private sector has, again, been a leader. Almost 200 U.S. manufacturers have committed to decreasing their energy intensity by 25 percent over 10 years as part of the Department of Energy’s Better Plants program.

These companies have already saved—already reported \$3.1 billion in reduced energy costs. We also see meaningful moves in the auto industry. Ford plans to nearly double its investment in electric vehicles in the next 5 years and GM is working towards an all-electric zero tailpipe emissions future with 20 new electric vehicle models to be available globally in the early 2020s.

The NEF projects that by 2040, 55 percent of new global car sales will be electric. Those States that have put a price on carbon have also seen both environmental and economic benefits.

The Regional Greenhouse Gas Initiative, known as RGGI, prices carbon dioxide emissions from the electric sector, serving nine States from Maryland to Maine. RGGI States have outperformed the rest of the country both environmentally and economically.

During its first 5 years, emissions decreased 35 percent in RGGI States but only 12 percent elsewhere. At the same time, RGGI State economies grew faster than the rest of the country.

These are just a few of the good news stories about State, local, and private-sector movement towards renewables and other forms of clean energy.

The degree of momentum behind this transformation and the resulting economic benefits to local communities across the country would be enhanced by Federal support for development and deployment of clean energy resources like renewables and energy efficiency.

As other countries invest in clean energy, it’s time for this Congress and the administration to step up support for States, cities, and businesses that are looking to seize the economic opportunities presented by clean energy transformation.

Thank you for your time.

[The prepared statement of Dr. Kennedy follows:]

TESTIMONY OF KEVIN KENNEDY, Ph.D.

DEPUTY DIRECTOR, U.S. CLIMATE INITIATIVE, WORLD RESOURCES INSTITUTE

HEARING BEFORE THE U.S. HOUSE ENERGY AND COMMERCE COMMITTEE

SUBCOMMITTEE ON ENERGY:

"THE SHIFTING GEOPOLITICS OF OIL AND GAS"

JUNE 26, 2018

Summary

The energy landscape in the United States today includes more than developments in the oil and gas industry. Many states, cities and businesses across the country see great economic potential in the possibility of a true clean energy transformation. A few examples include:

- Texas has been a leader in the move toward renewables, starting with the 2005 approval (by the legislature and then-Governor Rick Perry) of a \$7 billion investment in Competitive Renewable Energy Zones that has helped turn Texas into the national leader in wind energy.
- The economic potential of wind energy has lead Iowa, Kansas, Oklahoma and South Dakota to have more than 30 percent of their electricity generated from renewable resources.
- Georgetown, Texas, Mayor Dale Ross has lead his city to 100 percent renewables, noting that “[o]ne of the most important benefits of being 100 percent renewable is the potential for economic development. Many companies, especially those in the high-tech sector, are looking to increase green sources of power for both office and manufacturing facilities.”
- Automakers are betting on the emerging electric vehicle (EV) market, with Ford planning double its investment in the next five years and General Motors working towards an all-electric, zero tail-pipe emissions future with 20 new EV models to be available globally by the early 2020s.

While states, cities and businesses are stepping up on clean energy, Congress and the administration could and should be providing meaningful support for these efforts through increased clean energy research and development, incentives for deployment of clean energy technologies, investment in infrastructure for clean energy deployment and support for a carbon tax. Doing so would help companies and local communities across the country take advantage of the economic development opportunities that a clean energy transformation offers.

Introduction

My name is Kevin Kennedy, and I am the deputy director of the U.S. Climate Initiative at the World Resources Institute (WRI). The World Resources Institute is a non-profit, non-partisan environmental think tank that goes beyond research to provide practical solutions to the world's most urgent environment and development challenges. We work in partnership with scientists, businesses, governments, and non-governmental organizations across the globe to provide information, tools and analysis to address problems like climate change, the degradation of ecosystems and their capacity to provide for human well-being.

Stepping up on clean energy and climate action

The United States has seen significant progress on the development and deployment of clean energy and improving the efficiency of our energy use. Much of the progress has resulted from the leadership of states, cities and businesses, often with the support and cooperation of the federal government, in developing renewable resources, setting and enforcing building and efficiency standards and more. When President Trump announced his intent to withdraw from the international Paris Agreement last June, some feared that this progress might slow down. The Paris announcement, though, catalyzed a groundswell of continued and expanded commitment to climate action from states, cities, businesses, universities and individuals, all across the United States. Within days, over 1,200 leaders joined together to say, "We Are Still In" and committed to continue to support climate action to meet the Paris Agreement, and as of this weekend the declaration has been supported by over 2,800 leaders.¹

WRI, along with the Rocky Mountain Institute and the University of Maryland's Center for Global Sustainability, has been leading analysis for the America's Pledge initiative. This initiative, launched in

¹ For more information on We Are Still In, see <https://www.wearestillin.com/>. The press release from the initial announcement in June 2017 can be found at <https://www.wearestillin.com/news/leaders-us-economy-say-we-are-still-paris-climate-agreement>.

July 2017 by former New York Mayor Michael Bloomberg and California Governor Edmund G. (Jerry) Brown, aims to document the full range of actions being taken across American society, what more can be done, and to assess what these actions mean for our country's greenhouse gas emissions. The America's Pledge Phase 1 report, released last November, shows that leaders representing 159 million Americans and more than half of the U.S. economy have committed to act to reduce greenhouse gas emissions.² These leaders recognize that acting to support clean energy and address climate change can go hand in hand with economic growth and job creation.

The 271 cities and counties that said they remain committed, or are "still in," include Chicago, Dallas County and Houston, which is the single largest municipal buyer of green power in the country.³ Governors from 16 states and Puerto Rico, including Maryland, Colorado and North Carolina, have also seized this issue as a priority and declared their commitment. Furthermore, it is likely that states accounting for 35% of the U.S. economy will have a price on carbon emissions by the end of 2018.⁴ In addition, 345 institutions of higher education, from Kalamazoo College to the University of South Carolina, have also joined in.

Businesses are harnessing this momentum as well. Seventy-five companies with headquarters in the United States are among the 422 companies globally that have made commitments to establish a science-based greenhouse gas emission target under the Science Based Targets initiative.⁵ Their targets are science based if they are in line with the level of decarbonization required to keep global temperature increase below 2 degrees Celsius. Companies taking on these targets, like Owens-Illinois, a Fortune 500 company headquartered in Ohio and Applied Optoelectronics, a Texas-based fiber-optics

² <https://www.bbhub.io/dotorg/sites/28/2017/11/AmericasPledgePhaseOneReportWeb.pdf>

³ <http://www.houstontx.gov/mayor/press/city-expanding-renewable-energy.html>

⁴ These states are California and the nine states currently in the Regional Greenhouse Gas Initiative (Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island and Vermont), along with New Jersey and Virginia, which are taking steps to join RGGI.

⁵ <http://sciencebasedtargets.org/>

manufacturer, are doing so because they are looking to be leaders in the innovation that will build the low-carbon economy of the future. Companies ranging from McDonald's to Adobe to NRG Energy have not only committed to action, but have already set an official science-based target, putting them on track to becoming thriving members of the low-carbon economy.

Moreover, businesses have shown that they are willing to act with their wallets in an emphatic shift to clean energy – because it makes sense for them financially. In 2017 alone, large corporate buyers like Google, Kimberly-Clark and General Motors announced contracts for nearly 2.9 gigawatts of renewable energy, marking an 80% increase over similar purchases in 2016.⁶ This momentum has continued in 2018, with almost 2.5 gigawatts of contracts already announced this year.

In 2017 alone, large corporate buyers like Google, Kimberly-Clark and General Motors announced contracts for nearly 2.9 gigawatts of renewable energy, marking an 80% increase over similar purchases in 2016. This momentum has continued in 2018, with almost 2.5 gigawatts of announced contracts already this year.

Shifting to clean energy across the economy

The Paris Agreement withdrawal announcement had a galvanizing effect, but the reality is that market forces have been moving in such a direction that many of these states, cities and businesses had already realized that pivoting towards efficient use of clean energy resources could work to their benefit. We've been seeing this shift across sectors of the economy. In the following paragraphs, I will provide a few examples of the continuing progress in decarbonizing the economy, from electric power, energy efficiency and the auto market.

⁶ <http://businessrenewables.org/corporate-transactions/>

Renewables

Renewable energy offers a tapestry of examples from coast to coast, with some states and cities using policy to guide their actions, and others simply tapping the economic potential of developing renewable resources as technology costs fall. It's often a blend of the two, and in any case, states have typically benefitted from job creation and economic development, as well as happier ratepayers.

In many places around the country, this has been happening in bipartisan fashion. In 2016, Illinois found bipartisan common ground when they updated their Renewable Portfolio Standard (RPS), which mandates a certain percentage of energy be generated by different types of clean energy. After a comprehensive stakeholder engagement process, the bill passed the legislature with votes from both parties, and was signed into law by a Republican governor.⁷ Now, Illinois ranks 6th in the nation in terms of total wind energy generation, with plenty of additional growth slated to occur thanks to that update of the RPS that was included in the 2016 Future Energy Jobs Act signed by Governor Bruce Rauner. The act aims for 25% renewable energy by 2025, with a carve-out requiring a minimum of 75% of this be met by wind and solar. It also sets aside \$750 million for job training programs in the clean energy economy. All told it is expected to spur tens of thousands of jobs connected to improvements in energy efficiency and renewable energy in Illinois—jobs like solar installers and efficiency auditors.⁸ It's estimated that this package will spur an additional \$12 to \$15 billion in new private investment *and* lower ratepayers' bills, all while reducing CO₂ emissions by more than 33 million metric tons annually by 2030.⁹

In Michigan, utilities have stepped up, recently announcing a goal of at least 50% clean energy in Michigan by 2030 (half through renewables and half through energy efficiency).¹⁰ Meanwhile, the

⁷ <https://www.vox.com/energy-and-environment/2016/12/8/13852856/illinois-energy-bill>

⁸ <https://citizensutilityboard.org/future-energy-jobs-act/>

⁹ <http://blogs.edf.org/energyexchange/2016/12/07/illinois-future-energy-jobs-bill-shows-states-are-taking-the-lead-to-build-the-clean-energy-economy/>

¹⁰ <https://www.detroitnews.com/story/news/michigan/2018/05/18/michigan-dte-consumers-renewable-goal/35058065/>

Renewable Energy Standard in Michigan drove an estimated \$3 billion of in-state investments through 2014—a similar story to the Renewable Portfolio Standard in Ohio, where Governor Kasich vetoed a bill to weaken it. Keeping the Renewable Portfolio Standard intact was an easy choice for Kasich, as all he had to do is look at the positive economic and jobs impacts. The bill would have “amount[ed] to self-inflicted damage to both our state’s near- and long-term economic competitiveness,” he concluded.¹¹

It’s not just the Governor that is shifting the way energy is procured in Ohio. AEP Ohio, one of state’s traditionally coal-heavy utility companies, has committed to add more than 900 megawatts of wind and solar as part of their strategy for reducing their carbon footprint.¹² In fact, last October AEP Ohio put out an RFP for 400 megawatts of solar in-state, with an expressed preference for projects in Appalachian Ohio that would create permanent regional jobs and include a commitment to hire veterans.¹³

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One state that has successfully brought together a range of approaches to drive change in the power sector is New Jersey. Early this year, Governor Phil Murphy signed a legislature-approved package to boost the state’s Renewable Energy Standard to 50% by 2030, increase the solar requirement and double the net metering cap, and announced the largest offshore wind pledge in the U.S. This is already paying off, as a Danish company has already opened an office in Atlantic City to oversee their three

¹¹ <https://www.vox.com/energy-and-environment/2016/12/27/14094192/ohio-john-kasich-clean-energy-standards-veto>

¹² <https://www.aepohio.com/info/news/viewRelease.aspx?releaseID=2583>

¹³ <https://www.aepohio.com/b2b/rfp/2017SolarEnergy/>

gigawatts offshore wind project, which is expected create 1,000 jobs annually for the construction period, with 100 jobs being permanent.¹⁴ Last month, the state set a strong battery storage goal of two gigawatts by 2030, one of the most aggressive in the country, which exemplifies a trend we're seeing around the nation.¹⁵

Even the technologies that were once thought of as "fringe," such as offshore wind and battery storage, are riding the wave of a market shift towards renewables. For offshore wind, a perfect storm of technological, policy and market factors have caused the cost of the technology to plummet, and it is expected to further drop 17% by 2020 (from a 2018 baseline), and 44% by 2025.¹⁶ Prices for solar power are also dropping. Earlier this month, a solar contract in Nevada may have set a new cost record for solar at 2.3 cents per KWh.¹⁷ Meanwhile, battery prices have dropped 80% between 2010 and 2017, and are projected to keep falling.¹⁸

We're seeing a sweeping trend of cheaper renewables providing opportunities for states that are not looking to act on climate change to benefit from a cleaner power source simply because it makes economic sense.

¹⁴ http://www.pressofatlanticcity.com/news/breaking/orsted-celebrates-a-c-office-gets-first-federal-permit-for/article_b0b6c8d3-3039-5543-9a8b-60f55463b1bc.html

¹⁵ <https://www.utilitydive.com/news/new-jersey-sets-aggressive-target-2-gw-by-2030-for-energy-storage/524422/>

¹⁶ <https://www.bnef.com/core/insights/18819/>

¹⁷ <https://www.utilitydive.com/news/nv-energy-23-cent-solar-contract-could-set-new-price-record/525610/>

¹⁸ <https://www.bnef.com/core/insights/18819>

Texas has become a leader in wind energy. State leaders recognized the abundance of wind energy in their state just waiting to be harnessed and they saw the economic benefits that could result. To take advantage of this resource, they addressed barriers that could limit its development – particularly finding ways to ensure that wind energy generated in rural Texas could be delivered to its major cities. Texas is now far and away the number one wind producer in the country and boasts about 24,000 jobs in the wind energy sector.¹⁹ Texas built the foundation for its wind energy boom with the 2005 approval (by the legislature and then-Governor Rick Perry) of the \$7 billion Competitive Renewable Energy Zone initiative, a 3,600-mile network of transmission lines.²⁰

The economic benefits of this policy have included over \$50 million in lease payments to land-owners (many of whom are farmers and ranchers whose bottom-line is vastly improved thanks to these payments), an increase in the tax base for rural communities, and significant reductions in water

Texas is now far and away the number one wind producer in the country and boasts about 24,000 jobs in the wind energy sector....

The economic benefits ... have included over \$50 million in lease payments to land-owners (many of whom are farmers and ranchers whose bottom-line is vastly improved thanks to these payments), an increase in the tax base for rural communities, and significant reductions in water consumption needed for the power sector in a water-stressed state....

[S]tates from Texas to the Dakotas have recognized the economic opportunity of developing their renewable resources. In fact, in 2017 Iowa, Kansas, Oklahoma, and South Dakota all had more than 30 percent of their electricity generated from renewable resources, with North Dakota not far behind at 27 percent.

¹⁹ <https://www.awea.org/MediaCenter/pressrelease.aspx?ItemNumber=8736>

²⁰ https://e360.vale.edu/features/how_conservative_texas_took_the_lead_in_us_wind_power

consumption needed for the power sector in a water-stressed state.²¹

The state's generation capacity not only provides cheaper clean electricity for the state's retail market and jobs in Texas' wind-rich rural west, but also supplies growing demand from cities and businesses seeking to source their electricity from clean sources. In fact, Georgetown, Texas, a city of 50,000, is now 100% renewable.²² Georgetown Mayor Dale Ross noted that the city's move to renewables "is chiefly a business decision based on cost and price stability."

"One of the most important benefits of being 100 percent renewable is the potential for economic development. Many companies, especially those in the high-tech sector, are looking to increase green sources of power for both office and manufacturing facilities."
Georgetown, Texas, Mayor Dale Ross

He also noted that "[o]ne of the most important benefits of being 100 percent renewable is the potential for economic development. Many companies, especially those in the high-tech sector, are looking to increase green sources of power for both office and manufacturing facilities."²³

Overall, the great increase in renewable generation has been led from the middle of the country, as states from Texas to the Dakotas have recognized the economic opportunity of developing their renewable resources. In fact, in 2017 Iowa, Kansas, Oklahoma and South Dakota all had more than 30 percent of their electricity generated from renewable resources, with North Dakota not far behind at 27 percent.²⁴

²¹ <http://blogs.edf.org/energyexchange/files/2017/02/EDF-Texas-Report-to-Legislators-2017-FINAL.pdf>

²² <https://www.statesman.com/news/local/georgetown-now-100-percent-powered-renewable-energy/Mid2fionnWU1PlnZiVKEcO/>

²³ <https://www.mystatesman.com/news/opinion/ross-other-cities-should-follow-georgetown-lead-solar-energy/kvO7iGg5uqMjkk5HPM3Zul/>

²⁴ Based on data from the EIA electricity data browser, available at <https://www.eia.gov/electricity/data/browser/>.

Efficiency

Procuring clean energy isn't the only way that states, cities, and businesses are reducing their greenhouse gas emissions. They've made strides in improving their energy efficiency as well.

A handful of states have been leaders on this front, with 26 having established Energy Efficiency Resource Standards (EERS), which require utilities to reduce electricity or natural gas sales by implementing customer energy efficiency measures.²⁵ According to the American Council for an Energy-Efficient Economy, these states achieved 25.4 terawatt hours of net incremental savings in 2016 (0.68 percent of 2016 retail sales, enough to power 2.4 million American homes for one year, on average).²⁶ Arkansas, the only state in the Southeast with an EERS, has, through this and other programs, increased energy savings by a factor of five over the last decade, saving enough energy to power every home in Little Rock for three months.²⁷

Cities and companies have stepped up to boost their energy efficiency, with Texas again playing a leading role. EPA's ENERGY STAR program certifies buildings that are more efficient than 75 percent of similar buildings elsewhere; it also ranks cities based on the number of ENERGY STAR buildings in each city. Dallas, Houston and Austin all rank within the top 20 ENERGY STAR cities, with Dallas ranking #3.²⁸ Looking to smaller cities, Midland ranks #1, Odessa ranks #2 and San Angelo ranks #5 on the ENERGY STAR Top Small

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Dallas, Houston and Austin all rank within the top 20 ENERGY STAR cities, with Dallas ranking #3. Looking to smaller cities, Midland ranks #1, Odessa ranks #2 and San Angelo ranks #5 on the ENERGY STAR Top Small Cities List.

²⁵ <https://aceee.org/topics/energy-efficiency-resource-standard-eers>

²⁶ <http://aceee.org/sites/default/files/publications/researchreports/u1710.pdf>

²⁷ <https://arkansasadvancedenergy.com/index.cfm?objectid=37924D00-A460-11E7-9A910050569A5318>

²⁸ <https://www.energystar.gov/buildings/topcities>

Cities List. By investing in energy efficiency, the city of Arlington, TX is expecting to save more than 2.5 million kWh annually while saving \$14 million in energy costs over the next 15 years.²⁹

In the corporate space, close to 200 U.S. manufacturers and other industries have committed to decreasing their energy intensity by 25 percent over 10 years by adopting an array of strategies and other innovative approaches. In fact, they have already reported 600 trillion Btu of cumulative energy savings and \$3.1 billion in reduced energy costs.³⁰ Much of this success is thanks to partnerships with federal programs, such as the Department of Energy's Better Buildings, Better Plants Program.

Electric Vehicles

Many of the same states, cities and businesses that are stepping up on renewables and energy efficiency are also finding that investment in electric vehicles (EVs) fits in nicely with their overall shift towards cleaner technologies. Even with low gas prices, automakers know that proactive investment in EVs can pay off.

In January, Ford announced its plan to nearly double its investment in electric vehicles in the next five years.³¹ Meanwhile, General Motors is now working towards an all-electric, zero tail-pipe emissions future with plans for 20 new EV models to be available globally by the early 2020s.³² In Europe, Volkswagen announced plans to roll out *eighty* new EV models, marking a seismic expansion of zero-emissions mobility.³³ In fact, Bloomberg New Energy Finance (BNEF) projects that by 2040, 55 percent of

²⁹ <https://www.prnewswire.com/news-releases/city-of-arlington-to-save-14mm-through-landmark-energy-program-featuring-led-streetlights-300049261.html>

³⁰ "Successful Strategies: Driving Innovation & Results," U.S. Department of Energy, 2017, accessed June 22, 2018, https://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/Better_Buildings_Progress_Report_2017.pdf.

³¹ <https://www.wired.com/story/ford-electric-cars-plan-mach-1-suv/>

³² <http://www.gm.com/mol/m-2018-mar-0307-barra-speech.html>

³³ https://www.volkswagenag.com/en/news/2018/03/VolkswagenGroup_expand_production.html

new global car sales will be electric.³⁴ What may be surprising, however, is that BNEF also projects that by 2030, 84 percent of new global *bus* purchases will be electric.³⁵

States and cities are paying attention and grabbing hold of this momentum, and in some cases driving it even further. 10 states, representing over one third of the nation's car market, have committed to getting more than three million zero-emission vehicles on the road by 2025.³⁶ And 30 U.S. cities have committed

\$10 billion to begin implementing a plan to purchase 114,000 EVs for their municipal fleets³⁷—equal to 60 percent of the EVs sold in 2017.³⁸

Carbon Pricing

These examples help demonstrate the extent to which actions that drive economic growth and promote the protection of our environment can go hand in hand. Now, I'll turn for a minute to focus on the states and businesses that have put a price on carbon pollution and in turn delivered significant economic benefits to their region or their stakeholders.

The Regional Greenhouse Gas Initiative, or RGGI, is a carbon pricing system serving nine states from Maryland to Maine led by five Republican governors and four Democratic governors. By putting a price

In January, Ford announced its plan to nearly double its investment in electric vehicles in the next five years. Meanwhile, General Motors is now working towards an all-electric, zero tail-pipe emissions future with 20 new EV models to be available globally by the early 2020s.... BNEF projects that by 2040, 55 percent of new global car sales will be electric.

³⁴ <https://www.bnef.com/core/themes/119>

³⁵ <https://cleantechnica.com/2018/05/23/electric-buses-will-84-of-new-bus-sales-in-2030-bnef-forecast/>

³⁶ <https://www2.arb.ca.gov/news/california-applauds-multi-state-coalitions-releases-new-zero-emission-vehicle-action-plan>

³⁷ Ryan Kilpatrick, "Cities Across the U.S. Will Splurge on Electric Vehicles After Automakers Said There Wasn't Enough Demand," *Fortune*, March 15, 2017, accessed September 29, 2017, <http://fortune.com/2017/03/15/electric-vehicles-cities-demand/>

³⁸ David Gohlke and Yan Zhou, "Impacts of Electrification of Light-Duty Vehicles in the United States, 2010 – 2017," Argonne National Lab, Energy Systems Division, January 2018, <http://www.epd.anl.gov/anlpubs/2018/01/141595.pdf>.

on carbon emissions from their electric power plants, RGGI has helped drive a move towards lower carbon and zero carbon resources in the region. RGGI has also generated \$4.3 billion of net positive economic benefit since the program's inception in 2009^{39, 40, 41}, \$1.4 billion of which came between 2015 and 2017. In fact, states in RGGI have out-performed the rest of the country both environmentally and economically. Over the period from 2009 to 2014, the power sector carbon pollution covered by RGGI decreased 35 percent in RGGI states but only 12 percent elsewhere. At the same time, RGGI state economies grew 21.2 percent, compared to 18.2 percent elsewhere.⁴² Now, newly-elected governors in New Jersey and Virginia are pushing to join in and reap the benefits.

RGGI has helped drive a move towards lower carbon and zero carbon resources in the northeast. RGGI has also generated \$4.3 billion of net positive economic benefit since the program's inception in 2009, \$1.4 billion of which came between 2015 and 2017.... Over the period from 2009 to 2014, the power sector carbon pollution covered by RGGI decreased 35 percent in RGGI states but only 12 percent elsewhere. At the same time, RGGI state economies 21.2 percent, compared to 18.2 percent elsewhere.

California has put a carbon price on 85 percent of its carbon pollution, and directed significant portions of the resulting revenue into disadvantaged communities within the state. In 2017, two studies looked at the economic impacts of the program in the San Joaquin Valley and the Inland Empire, two of the most economically and environmentally challenged regions in California. These studies found the program was a net economic benefit in both regions: the San Joaquin Valley saw net direct economic

³⁹ http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/analysis_group_rggi_report_april_2018.pdf

⁴⁰ https://www.dec.ny.gov/docs/administration_pdf/ag15rggi.pdf

⁴¹ http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/economic_impact_rggi_report.pdf

⁴² <https://www.ceres.org/sites/default/files/Fact%20Sheets%20or%20misc%20files/RGGI%20Fact%20Sheet.pdf>

benefits of \$119 million and 700 jobs were created directly as a result of the program⁴³; and in the Inland Empire, the program had net economic impacts of \$25.7 million, \$900,000 in tax revenue and net employment growth of 154 jobs.⁴⁴

Companies are also using internal carbon prices as a tool for integrating climate change considerations into their business decisions.⁴⁵ According to CDP⁴⁶, as of last fall, 96 U.S. businesses used internal carbon prices, while 142 U.S. businesses planned to implement internal carbon pricing by 2019.⁴⁷ A few of those companies with internal carbon prices include Exxon, Shell and BP.⁴⁸

Congress and the administration should support these efforts

States, cities and businesses across this country are pushing forward, some loudly and some quietly. This shifting tide towards cleaner sources of energy is happening—from Maine to Kansas to Hawaii—and it will not be abated. This Congress and administration should be taking measures to bolster the changes that are already occurring on the ground. If we're all in this together, we'll all be better off.

Before closing, I'd like to point to four areas that could use the strong support of congress:

1. **Increased clean energy research and development:** More robust investment in research, development and deployment of clean energy technologies could yield significant economic and

⁴³ <https://www.law.berkeley.edu/research/clee/research/climate/economic-impacts-of-californias-major-climate-programs-on-the-san-joaquin-valley/>

⁴⁴ <https://www.dailybulletin.com/2017/07/12/cap-and-trade-system-an-economic-net-positive-for-inland-empire-guest-commentary/>

⁴⁵ <https://www.wri.org/blog/2015/11/4-corporate-carbon-pricing-do%E2%80%99s-and-don%E2%80%99ts>

⁴⁶ CDP runs a global disclosure system that enables companies, cities, states and regions to measure and manage their environmental impacts, and has the most comprehensive collection of self-reported environmental data in the world.

⁴⁷ "Putting a price on carbon: Integrating climate risk into business planning," CDP, October 2017, accessed October 16, 2017, <https://b8f65cb373b1b7b15feb-c70d8ead6ced550b4d987d7c03fcd1d.ssl.cf3.rackcdn.com/cms/reports/documents/000/002/738/original/Putting-a-price-on-carbon-CDP-Report-2017.pdf?1507739326>.

⁴⁸ <http://www.climatechangenews.com/2013/12/06/exxon-shell-and-bp-operating-internal-carbon-prices/>

environmental benefits. Accelerating the development of even cheaper technologies and modifications to current technologies is crucial as we approach the second quarter of this century.

2. **Incentives for deployment:** Clear and strong incentives for emerging technologies like renewables, electric vehicles and battery storage can ensure that developers don't take their foot off the pedal and continue to facilitate this shift across the country.
3. **Infrastructure for clean energy deployment:** An infrastructure overhaul is sorely needed in this country and, according to Gallup polling, it was far and away President Trump's most popular campaign promise.⁴⁹ Texas has seen the dividends that can come from investment in clean energy infrastructure, like transmission lines. Additional investments in infrastructure for electric vehicle charging, smart grids, bus rapid transit and other clean energy opportunities can pay dividends. Let's take this opportunity to move our national infrastructure into the 21st century.
4. **Carbon tax:** James Baker III, George P. Schultz, Janet Yellin, former Senate leader Trent Lott, former Senate leader John Breaux, Larry Summers—these are just a few of the political and economic luminaries who have come out in support of a carbon tax. Companies including ExxonMobil and Shell are also in favor.⁵⁰ These leading voices know that our energy mix is shifting—that our energy mix *must* shift—to avoid catastrophic climate change. They also know that a carbon price is often the cheapest and most efficient way to reduce emissions.

⁴⁹ <https://news.gallup.com/poll/202691/infrastructure-spending-deemed-important-trump-promise.aspx>

⁵⁰ <https://www.clcouncil.org/>

American leadership for the 21st century

In the United States, we rightfully pride ourselves on not backing down from any challenge because it's too hard. We have the opportunity now to take on the challenge of addressing climate change by making America a leader in the global clean energy revolution that is starting to unfold. Throughout the country, states, cities and businesses are seeing the economic opportunities presented by tapping our clean energy resources and finding ways to use them efficiently. I encourage this Congress and the current Administration to step up with Americans from across the country to embrace the challenge – and the opportunity – of being a leader on clean energy.

Mr. UPTON. Mr. Hamm, welcome.

STATEMENT OF HAROLD HAMM

Mr. HAMM. Thank you, Chairman Upton, Acting Ranking Member McNerney, and other members of the committee.

My name is Harold Hamm. It's my honor to address you today on the miracle of American oil and gas and its global impact.

As chairman of the Domestic Energy Producers Alliance and CEO of the company that co-developed the first oil field ever drilled exclusively with horizontal drilling and a company that is the largest leaseholder and most active driller and largest producer both in the Bakken play in North Dakota and the SCOOP/STACK and Springer plays of Oklahoma, I've been able to pioneer and participate in the American energy renaissance firsthand.

I testified to the House Agricultural Committee on July 8, 2015, about the American energy renaissance and in particular was asking for lifting of the ban on exportation of crude oil, and it was granted. We got it signed into law. President Obama signed it into law and I appreciated that.

Of course, we have to remember back. It was on the omnibus bill—it's a little bit hard not to sign—and a 2-year extension was given to wind and solar at that time and, of course, 2 years times 10. It was a very costly addition—the cost renewals.

I said it then and I will say it again—the American energy renaissance is the single-most defining aspect on this planet today that will shape the next 50 years ahead of us.

In the past 10 years, the United States has undergone unprecedented transformation, as Daniel said, and thanks to the ingenuity of America's independent oil and gas natural producers—oil and natural gas producers we are transitioning from a consuming short supply nation to an energy long supplier dominating the world oil market today.

Our country has rapidly gone from fears of energy scarcity to understand that U.S. energy independence is well within our reach. I think that will happen late 2020. We are a little ahead of the IEA on that, and during this Trump administration we've become not only energy dominant but we'll become energy sufficient and independent in the future.

And so we have had to rely on other countries to fuel our energy needs drastically in the past, primarily from the Middle East.

The instability of shifting alliances wreaked havoc on American foreign policy for decades, and that's been complicated by Russia and their involvement as well in the country's global affairs.

But the American energy renaissance is rapidly shaping those complicated dynamics to align with the U.S. to produce all the energy that it needs.

Our energy imports have dropped from over 30 percent of energy consumed in 2007 to less than 8 percent currently, and because of these production gains, the U.S. no longer has to put American lives in the Middle East particularly.

The ban on exports of crude oil was lifted in 2015—we talked about that—and we are now on pace to become a net energy exporter and provide our allies with a reliable affordable supply of

vital commodities like oil, LNG, and other petroleum products, and we can also impact the world with these clean fuels.

Rising U.S. oil production has proven to be vital in meeting global demand as production capacity — while eliminating dramatic price hikes have long been a hallmark of global markets.

Total petroleum exports are now averaging close to 7 million barrels a day, roughly, 2 million of which is crude oil.

The commitment of the Trump administration to repealing unnecessary and in many cases archaic and onerous regulations is the right move for America.

There are still a couple around the CAFE standards that was approved back when everybody thought we was running out of oil. Certainly, it is wreaking havoc with the—on the highways today and claim an additional 10,000 lives per year due to the small size imposed by CAFE standards on vehicles.

Also, the archaic SCC rules need to be changed that limit our production and booking just to 5 years. If we are to be energy dominant, we certainly need to recognize that.

And we've done it environmentally sound, no governmental assistance or subsidies. It's all come from the independent sector.

Thank you.

[The prepared statement of Mr. Hamm follows:]

**Statement by Harold Hamm
Chairman and Chief Executive Officer
Continental Resources, Inc.
U.S. House of Representatives, Committee on Energy and Commerce
Subcommittee on Energy
“The Shifting Geopolitics of Oil and Gas”
June 26, 2018**

Summary:

- As Chairman of the Domestic Energy Producers Alliance and as CEO of the company that co-developed the first oil field ever drilled exclusively with horizontal drilling, I have been able to pioneer and participate in the American Energy Renaissance first-hand. The American Energy Renaissance is the single-most defining aspect on this planet today that will shape the next 50 years.
- Our country has rapidly gone from fears of energy scarcity to understanding that U.S. energy independence is within our reach and during a Trump administration, the United States of America will become energy dominant.
- The U.S. oil industry is poised to continue its production gains, thanks to regulatory rollbacks under President Trump that have removed artificial barriers to growth.
- The commitment of the Trump administration to repealing unnecessary and in many cases, archaic and onerous regulations is the right move for America. For too long those regulations have had a stranglehold on the American economy. Many regulations were implemented with an oil and gas scarcity mentality and have since become inapplicable and obsolete.
- I applaud the Trump administration and their willingness to roll back regulations that defy logic and to implement common sense regulations that allow America to prosper.

Written Statement:

Chairman Upton, Ranking Member Rush and Members of the Committee, my name is Harold Hamm. I serve as Chairman and Chief Executive Officer of Continental Resources, an Oklahoma City-based independent oil and gas exploration and production company. It's an honor to address you today on the miracle of American oil and gas and its global impact.

As Chairman of the Domestic Energy Producers Alliance and as CEO of the company that co-developed the first oil field ever drilled exclusively with horizontal drilling, and the company that is the largest leaseholder and most active driller and largest producer both in the Bakken Play in North Dakota and the SCOOP/STACK and Springer plays of Oklahoma, I have been able to pioneer and participate in the American Energy Renaissance first-hand. I testified to the House Agriculture Committee on July 8, 2015 about The American Energy Renaissance. I said it then and will say it again – The American Energy Renaissance is the single-most defining aspect on this planet today that will shape the next 50 years.

In the past 10 years, the United States has undergone an unprecedented transformation. Thanks to the ingenuity of America's independent oil and natural gas producers, we are transitioning from a consuming short-supply nation to an energy-long supplier, dominating the world oil market. Our country has rapidly gone from fears of energy scarcity to understanding that U.S. energy independence is within our reach and during a Trump administration, the United States of America will become energy dominant.

For too long, the United States had to rely on other countries to fuel its energy needs, particularly crude oil from the Middle East, whose instability and shifting alliances wreaked havoc on American foreign policy for decades. Russia's rise as an energy producer complicated our country's global affairs. But the American energy renaissance is rapidly shifting those complicated dynamics, allowing the U.S. to produce all of the energy it needs.

Our energy imports have dropped from over 30 percent of energy consumed in 2007 to less than 8 percent currently. Because of our production gains, the U.S. no longer has to put American lives at risk to protect our energy sources. Nations fronted by dictators or hostile regimes can no longer threaten us with reduced oil supplies, giving these rogue states less influence on global affairs. U.S. foreign policy has been transformed now that the need for continued oil supplies is taken out of the equation when dealing with other countries.

The ban on exports of crude oil was lifted in 2015 and we are now on pace to become a net energy exporter by 2020, allowing the U.S. to provide its allies with a reliable, affordable supply of vital commodities like oil, LNG and other petroleum products.

Rising U.S. oil production has proven to be vital in meeting global demand, as the spare production capacity touted by OPEC approaches historically low levels. Our gains have prevented a likely world oil shortage, while eliminating dramatic price spikes that have long been the hallmark of global oil markets. Total petroleum exports are now averaging close to 7 million barrels of oil per day – roughly 2 million of which is crude oil - and are becoming the norm from the U.S., offsetting crude oil imports to this country by foreign national oil companies

and countries who bought up 30% of our oil refineries for their own benefit. The increase in exports will continue to create U.S. energy jobs and insulate our economy from commodity price shocks in the future.

Stable prices are a boon to industrialized countries and developing nations around the world, but the U.S. needs to keep increasing its crude oil exports to keep world prices in an acceptable range.

This historic transformation from energy scarcity to energy abundance is already resulting in a stronger balance of trade and unprecedented global energy security for the United States.

And in a boon to our economy, the United States can participate in stronger global energy prices. In two short years, the U.S. will flip the script on crude oil, moving from the world's biggest customer for imported oil to a net oil exporter. That kind of conversion is unprecedented, but it will immeasurably improve the lives of all Americans. However, the U.S. needs to continue with significant new investment from U.S. companies in pipelines and port capacity for export shipments to harness our energy abundance and realize our full potential. As this infrastructure becomes available, we will fully engage in the free global market of oil and natural gas and exert our energy dominance. Our policies should foster this infrastructure expansion and promote the free flow of energy throughout our country.

In the meantime, we can expect record employment in the energy sector, growing exports of crude oil, growth in the production and use of clean natural gas and growing LNG shipments around the globe, with cleaner air becoming the norm abroad as it has in the U.S.

The U.S. oil industry is poised to continue its production gains, thanks to regulatory rollbacks under President Trump that have removed artificial barriers to growth.

The commitment of the Trump administration to repealing unnecessary and in many cases, archaic and onerous regulations is the right move for America. For too long those regulations have had a stranglehold on the American economy. Many regulations were implemented with an oil and gas scarcity mentality and have since become inapplicable and obsolete.

A perfect example is the current extreme CAFE standards for motor vehicles. The Trump administration recently announced they will work to revise the excessive rules set forth during the Obama administration.

CAFE standards for motor vehicles were the product of the Energy Conservation Act, passed by Congress in 1973 in response to the energy shortage created by the Arab oil embargo. The premise was based on declining supplies. The regulation has hampered American auto manufacturers and is actually putting American lives at risk. Vehicle fatality rates had fallen for all vehicles in recent decades, but they have rose again to claim an additional 10,000 Americans per year due to the small size imposed by CAFE standards. The vehicle fatality rate in 2016 was

the highest since 2007. Vehicle size/weight and fatality rates have a direct link. To meet fuel economy standards, automakers must “lightweight” the vehicles, compromising safety.

In addition, the archaic SEC 5-year rule on booking reserves vastly understates oil and gas reserves in America and doesn’t allow companies, or the country, to accurately state its true reserves. The U.S. has enough technically recoverable reserves to continue producing 10 million barrels of oil a day for more than 75 years, and this figure is likely to be revised higher.

I applaud the Trump administration and their willingness to roll back regulations that defy logic and to implement common sense regulations that allow America to prosper.

Our push to become a net energy exporter is important to further reduce our country’s trade deficit, which has been expanding over time. Our deficit stood at \$46.2 billion in April, as other countries have taken advantage of the U.S. in past trade deals. The Trump administration’s recently-enacted tariffs on some foreign goods were necessary to protect American businesses in the global market. Countries like China have been artificially subsidizing their industries, but the administration’s new tariffs will level the playing field.

The United States has the lowest gasoline and diesel prices in the developed world today. U.S. consumers are enjoying a low gasoline price environment due to low fuel taxes, growing oil production, substantial refining assets and supportive regulatory policy. The initial impact of new U.S. oil coming into the market drove diesel costs from \$4 dollars a gallon, briskly down to \$2.25. And U.S. exports are keeping global oil prices (represented primarily by Brent) in check.

One can only imagine the price of oil and gasoline without the influence of U.S. crude into the market.

The unprecedented gains in our economy and the miracle of American oil and gas is shifting the geopolitical balance of power back to the United States of America.

ABUNDANT U.S. OIL RESERVES MAKE CAFE STANDARDS OBSOLETE

FATALITIES ARE ON THE RISE

- The 2016 fatality count (37,461) is the highest since 2007, and the fatality rate of 1.18 is the highest since 2008.
- Vehicles are safer overall due to new technology and safety standards, but policy has limited the benefit.
- Newer vehicles in particular show up as much safer given improvements in technology and standards.
- Fatality rates have fallen for all vehicles in recent decades, but improvements have started to slow and fatalities are on the rise again.

FATALITIES VS VEHICLE SIZE AND WEIGHT

- There is a direct link between vehicle size/weight and fatality rates.
- The smaller the vehicle, the higher the fatality rate.
- Average vehicle weight is not rising as much as before, despite a continued shift towards SUVs, which is partly due to lightweighting, which is likely limiting safety gains.
- Even adjusted for number of registered vehicles or miles driven, passenger cars are less safe for the occupants than light trucks, which are less safe than large trucks.
- These trends hold even for cars 1-3 years old.
- To meet future fuel economy standards, automakers must "lightweight" the vehicles, compromising safety.

CAFE STANDARDS ARE UNREASONABLE AND UNNECESSARY

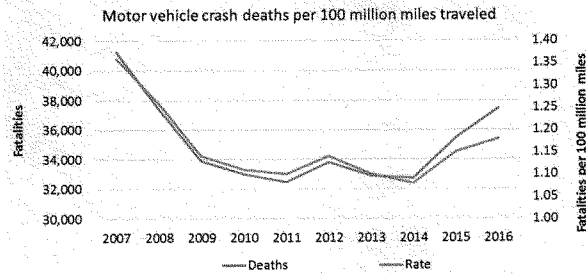
- America is not short oil anymore. The US has 275.8 billion barrels of technically recoverable reserves of crude oil. At production of 10m bbl/d, that is 75 years of production.
- The current market has a plethora of models and options that offer high fuel economy and exceed 2020 standards already.
- Upcoming standards are unreasonable. Over ¼ of current models meet 2020 standards, but this quickly falls off to <10% by 2022. Even some hybrids may struggle to meet future standards.
- New standards may not be achievable without compromising safety via lighter weight.
- The standards have minimal environmental benefit. Global transportation only accounts for 20% of global CO₂ emissions. Light Duty Vehicles account for less than 10%.

ECONOMICS

- Trucks and SUVs are taking market share among consumers, partly due to safety concerns
- Margins for automakers are much higher on trucks and SUVs than on cars
- Auto analysts have pegged the variable margin on each truck at \$8,000-\$10,000. Compare that to \$2,500 on average for all vehicles sold, and it is easy to see that the trucks/SUVs contribute an outsized share of profitability.
- North American automakers are shifting away from making cars due to profitability, customer preference and technical issues of meeting CAFE standards.
- Foreign automakers are doubling down on smaller cars and taking market share, as US manufacturers pull back, therefore putting America last.
- This policy puts American jobs and manufacturing at risk.

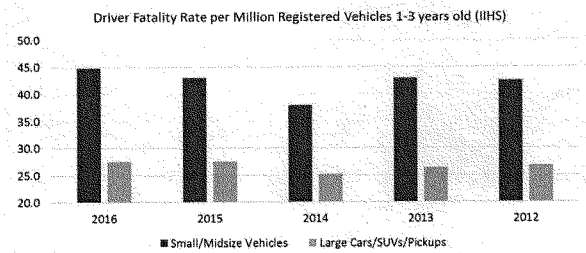
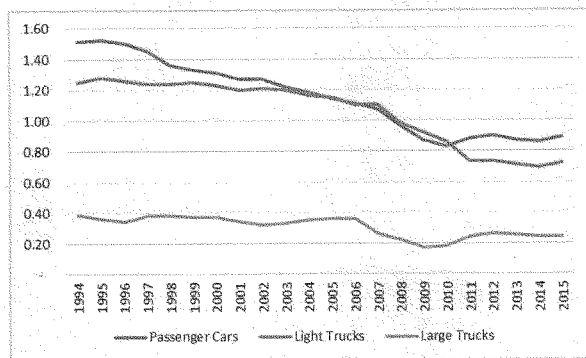
FATALITIES

Overall fatalities and the rate per mil are on the rise.



Light Trucks are much safer than passenger cars and have seen fatality rates fall more in recent years.

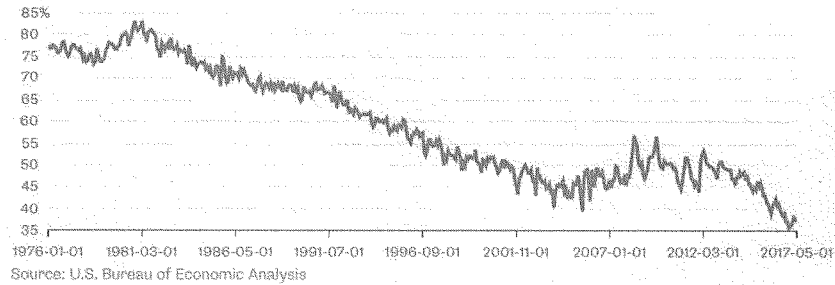
Occupant Fatality Rate per 100 Million VMT



CARS CONTINUE TO LOSE MARKET SHARE TO SUVs AND TRUCKS

Cars Resume Their Decline

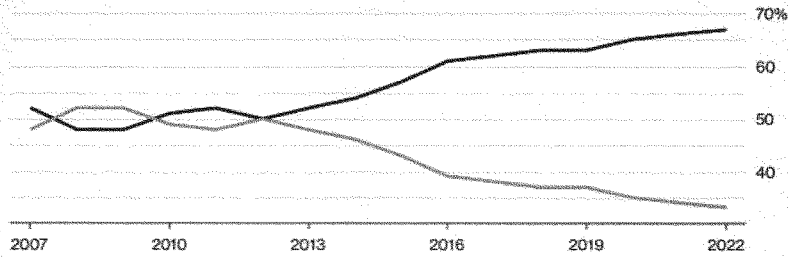
Car sales as a percentage of total U.S. light-vehicle sales



Collapsing Cars

Share of annual new vehicle sales in the U.S. shifting toward trucks, SUVs at rapid clip

■ Truck ■ Car

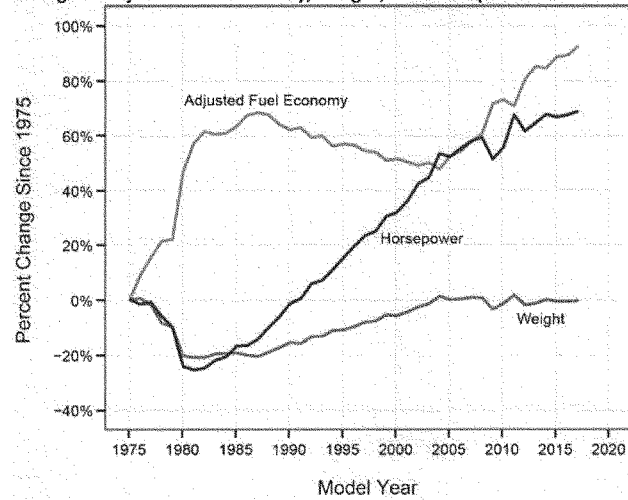


Source: AlixPartners, Automotive News, IHS

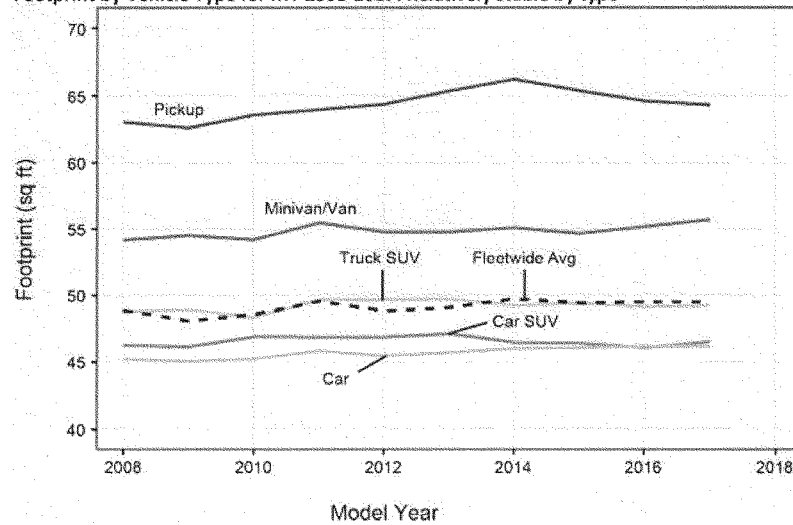
Bloomberg

**GAINS IN VEHICLE WEIGHT HAVE SLOWED DESPITE A SHIFT TOWARDS SUVs.
VEHICLES ARE NOT GETTING LARGER WITHIN THEIR CLASS EITHER**

Change in Adjusted Fuel Economy, Weight, and Horsepower for MY 1975-2017

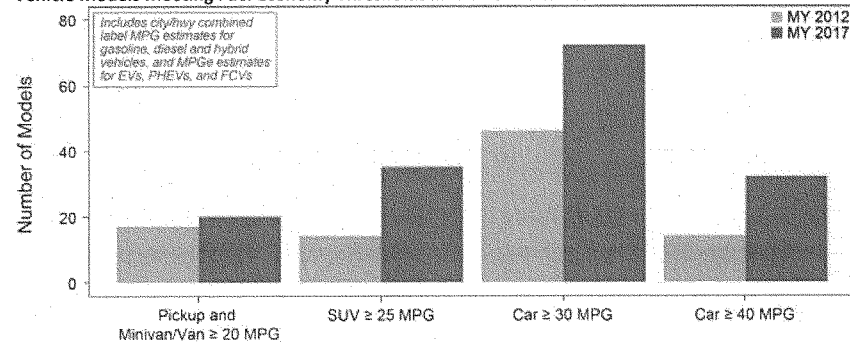


Footprint by Vehicle Type for MY 2008-2017: Relatively stable by type



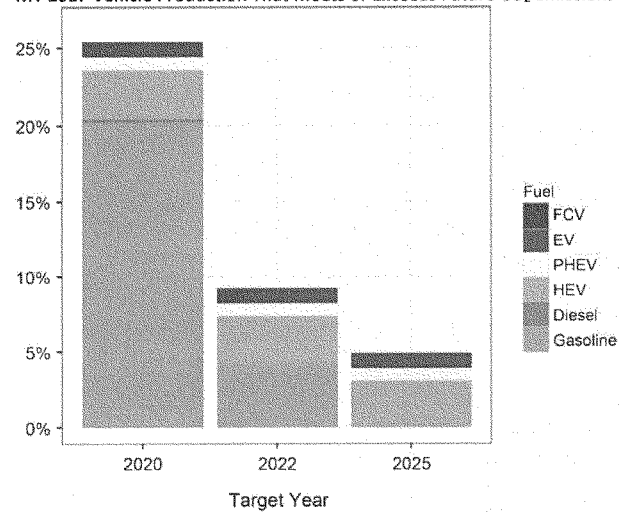
Consumers already have an increasing number of high fuel economy/low CO₂ vehicle choices

Vehicle Models Meeting Fuel Economy Thresholds in MY 2012 and 2017



Emission Targets Are Too Steep and Unrealistic

MY 2017 Vehicle Production That Meets or Exceeds Future CO₂ Emissions Targets



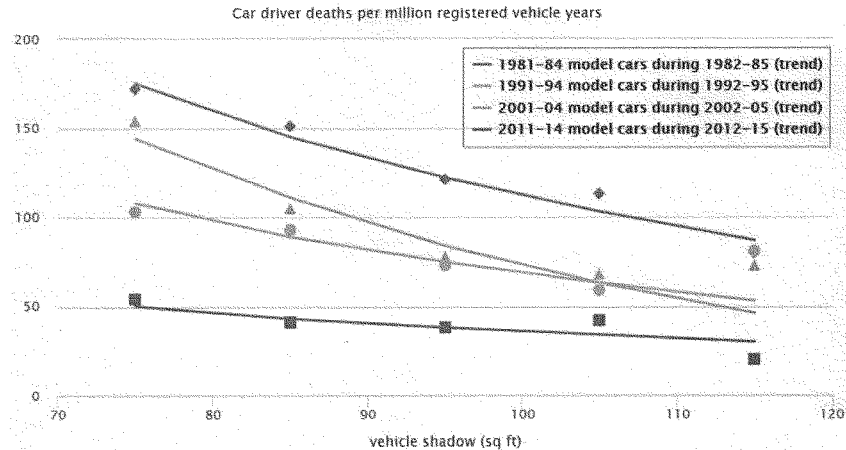


Table 9.1. Technically recoverable U.S. crude oil resources as of January 1, 2015

billion barrels

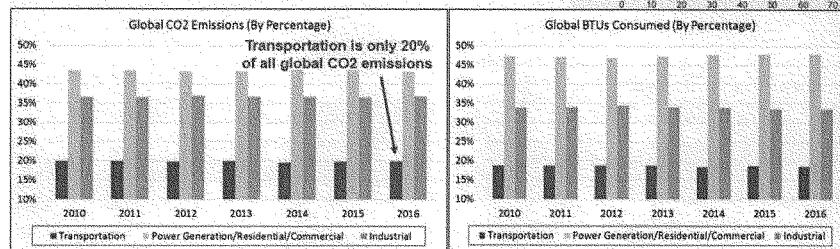
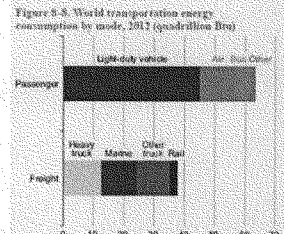
	Proved Reserves	Unproved Resources	Total Technically Recoverable Resources
Lower 48 Onshore	31.8	152.1	183.9
East	0.6	4.8	5.4
Gulf Coast	7.1	34.0	41.1
Midcontinent	2.6	14.4	17.0
Southwest	9.0	54.1	63.1
Rocky Mountain/Dakotas	9.8	40.4	50.2
West Coast	2.7	4.5	7.1
Lower 48 Offshore	5.3	49.6	55.0
Gulf (currently available)	4.8	36.6	41.4
Eastern/Central Gulf (unavailable until 2022)	0.0	3.7	3.7
Pacific	0.5	6.0	6.6
Atlantic	0.0	3.3	3.3
Alaska (Onshore and Offshore)	2.9	34.0	36.9
Total U.S.	39.9	235.8	275.8

Note: Crude oil resources include lease condensates but do not include natural gas plant liquids or kerogen (oil shale). Resources in areas where drilling is officially prohibited are not included in this table. The estimate of 7.3 billion barrels of crude oil resources in the Northern Atlantic, Northern and Central Pacific, and within a 50-mile buffer off the Mid and Southern Atlantic Outer Continental Shelf (OCS) is also excluded from the technically recoverable volumes because leasing is not expected in these areas by 2040.

Source: Onshore and State Offshore - U.S. Energy Information Administration; Alaska - U.S. Geological Survey (USGS); Federal (Outer Continental Shelf) Offshore - Bureau of Ocean Energy Management (formerly the Minerals Management Service); Proved Reserves - U.S. Energy Information Administration. Table values reflect removal of intervening reserve additions between the date the latest available assessment and January 1, 2015.

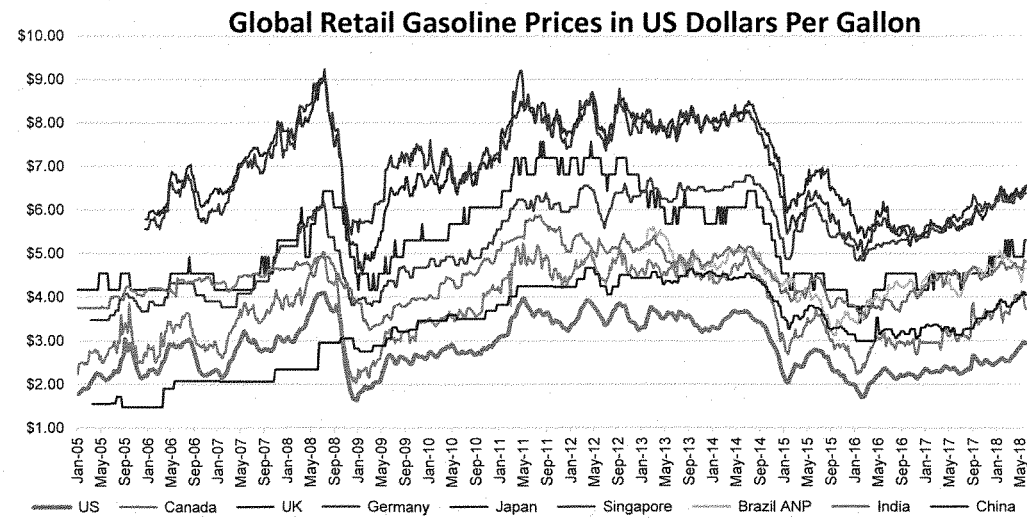
Passenger Vehicles Account for a Small Portion of Global CO₂ Emissions

- Transportation only comprises 20% of all CO₂ emissions
- Light duty vehicles account for less than 10% of global CO₂ emissions



US Gasoline Prices Are Already Some of the Lowest in the World

- Low fuel taxes, growing oil production, substantial and sophisticated refining assets and supportive regulatory policy all contribute to a healthy gasoline price environment
- By exporting more, the US can help to keep prices down for all consumers

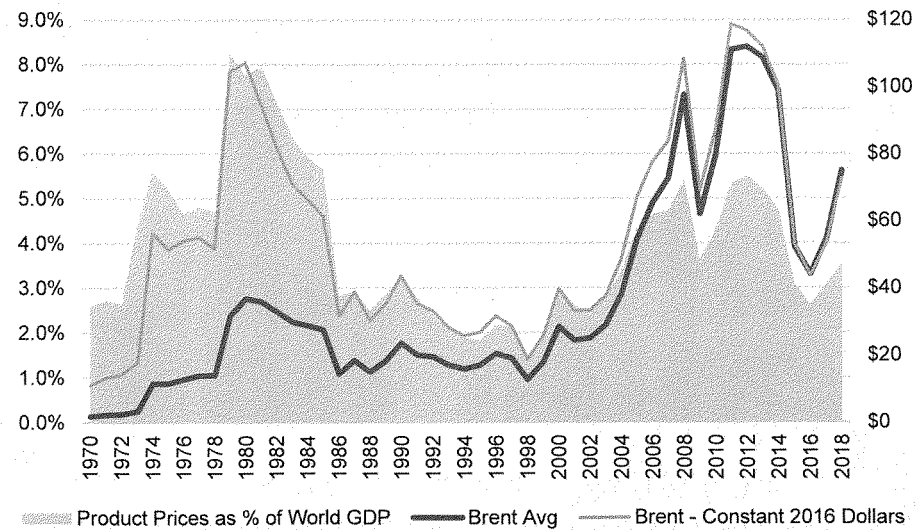


Sources: Bloomberg

Overall Global Oil Prices Are Not Overly High in a Historical Context

$$\text{Product Burden} = \frac{(\text{Avg Brent Price} + 321 \text{ Crack} + \text{US Retail Spread}) \times \text{Total Liquids Demand}}{\text{World GDP (in USD)}}$$

Prices as a % of Economic Activity Show Reasonable Price Levels



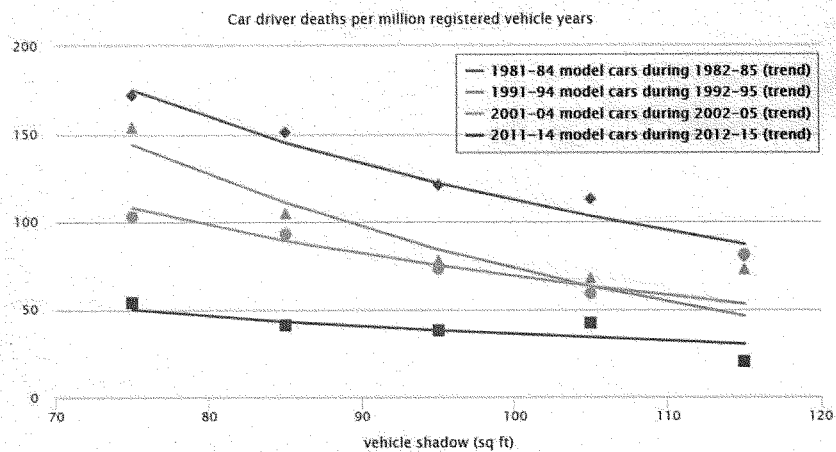
Sources: Bloomberg, IMF, IEA

U.S. VEHICLE SAFETY:

The Insurance Institute for Highway Safety (IIHS) compiles data and statistics on vehicle safety

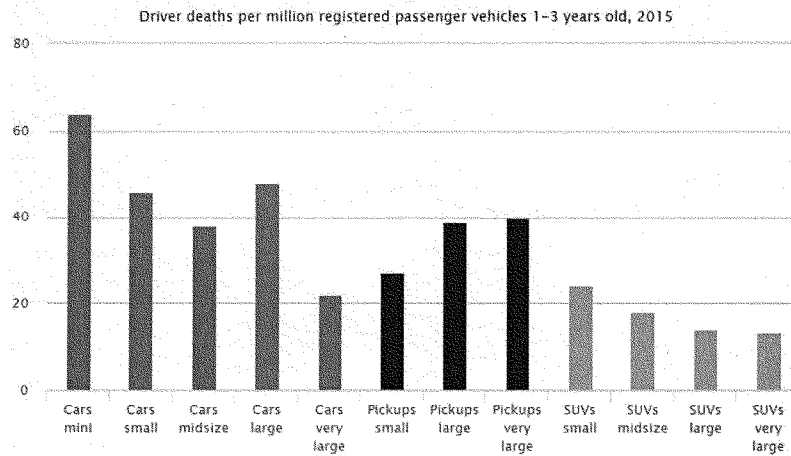
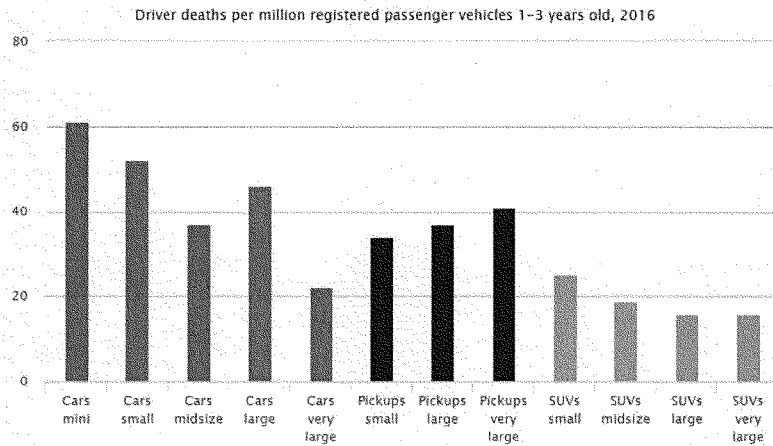
Some interesting data points:

- See chart below. The larger the vehicle, the safer it is...
- Generally, newer cars have become safer for similar sizes. Despite a car being newer, the larger the vehicle is, the safer it is. The vehicle shadow is the area of the vehicle's length times width.

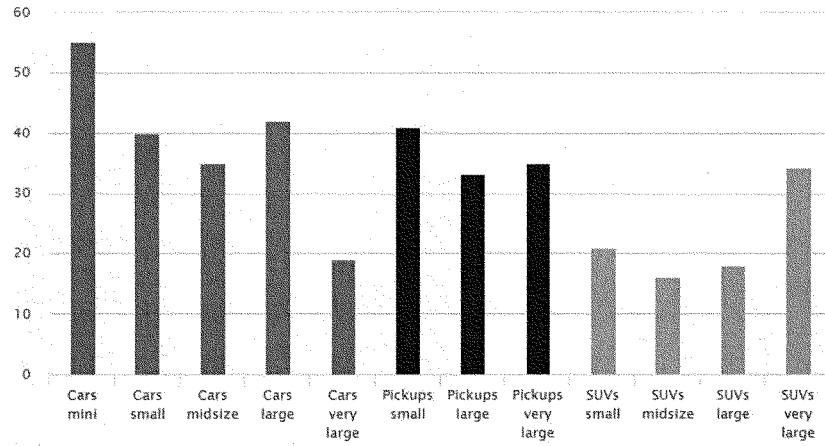


- IIHS also did a study of insurance claims for a vehicle that was conventional and the same model that was a hybrid that was 10% heavier. The study found that people in the heavier vehicle were 25% less likely to be injured than in the lighter version of the same vehicle. All things being equal, a heavier vehicle is safer.

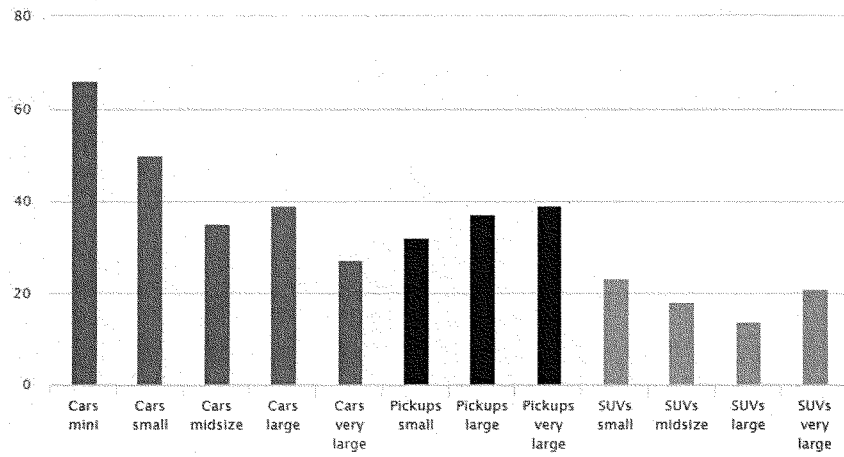
- IIHS also classifies driver fatality rates by car type (see charts below)
 - Mini and Small Cars typically have the highest fatality rates
 - SUVs are clearly the lowest
 - Pickups seem to have variance, but are higher than some of the larger car models

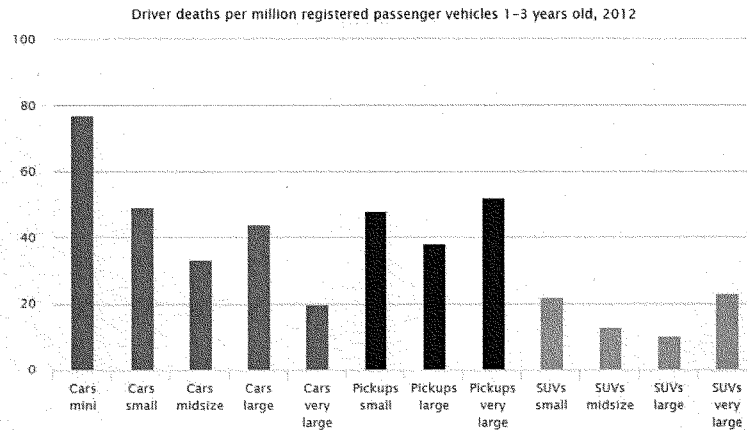


Driver deaths per million registered passenger vehicles 1-3 years old, 2014



Driver deaths per million registered passenger vehicles 1-3 years old, 2013





Links to IIHS information:

<http://www.iihs.org/iihs/topics/t/vehicle-size-and-weight/qanda#cite-text-0-1>

<http://www.iihs.org/iihs/topics/t/vehicle-size-and-weight/fatalityfacts/passenger-vehicles/2016>

Mr. UPTON. Thank you all. You know, I remember coming to Washington as a young staffer—I am still young—and I remember the gas lines.

I remember having a 1 at the end of my license plate which allowed me to fill up, after an hour and a half, at a Shell station around the corner here on Capitol Hill.

And, Mr. Arriola, I don't know how you did it but you got one of the sharpest people in your organization in the woman behind you, Maryam Brown.

She was one that worked hard with our Energy and Commerce staff to actually develop the strategy that, I got to tell you, was bipartisan—the North American Energy Independent Plan—and laid it out.

We had testimony from Dr. Yergin back then, who predicted that we could do this if you unshackle the industry, and I got to tell you, 9 years ago, the day that President Obama was sworn in, the gas price—average gas price, and that was before Memorial Day and before July 4th, was \$3.84 a gallon, and it hurt a lot of people, particularly the most vulnerable.

And as I recall, that summer gas prices got pretty close to \$5.00 and even over—in some areas like California even maybe \$6.00 a gallon.

This last weekend, I was home in Michigan. I watched gas prices at \$2.65. So forget inflation. I mean, we are so much better off, and the strategy that we laid out, which, again, was bipartisan.

Mr. Hamm talked about it. President Obama signed it into law to lift the crude oil, and there were still some, even from Texas, who voted against the omnibus, even though that was part of it, despite Mr. Barton's pleading, and he did a great job in lining up the support to get that done.

But where would we be today without this? And I guess the other quick question that I have for Mr. Yergin, you said in your testimony that we anticipate that U.S. production could grow by another 60 percent over the next 20 years.

You know, I talk to my farmers who use natural gas to dry their corn. You know, most of my constituents—many of them, anyway—have natural gas for heating and cooling and so those rates have gone down. They're not even a third of what they were 10, 15 years ago.

Where are we headed with this continued new production that in fact not only can we export and so help our balance of trade, but what is that going to do for the average family across the country?

Dr. YERGIN. What it's meant is lower cost for electricity, lower cost for heating, and it's also, because of the impact on this economy, I mentioned in my written testimony we've added about \$120 billion of new investment directly in manufacturing, about maybe a same amount as ancillary.

So it's created a lot of jobs. It's really been beneficial across the board.

Mr. UPTON. And it's done a lot for the climate as well. I mean, we know that emissions—CO₂ emissions—have dropped by 30 percent. I think half of that is just by the transformation to coal—from coal, I should say.

Dr. YERGIN. Well, I mean—yes, if you look at it, our emissions today are back to the level of the early 1990s although our economy has almost doubled since that time and gas has been an important part of that.

Mr. UPTON. Mr. Hamm, you indicated in your testimony that U.S. has the lowest gas and diesel prices in the developed world. What are the biggest drivers of reducing those prices and what can we do to continue to keep those prices low?

Mr. HAMM. A lot of it has to do with the product that's produced. Just like the Bakken—you know, that's—that oil has no bottoms to speak of, no asphalt.

Basically, a lot of middle distillates, which is gasoline, diesel, kerosene, and when that—you know, prior to it coming into existence back in 2007, you saw diesel prices at \$4.00, \$4.50 a gallon, and that was because there wasn't much you could wring out of a barrel of bitumen coming in from Canada.

But with the addition of all this oil coming in in the Bakken, that price went to \$2.25 and it did it very quickly. And so as a result, we see both diesel and gasoline prices the cheapest that you have seen.

And so we have the lowest gasoline prices in the world that we are enjoying and this is with some State taxes on it, and some of them, like, California, get pretty high.

Mr. UPTON. So in my remaining 15 seconds, if the oil price stays about the same—where it is today—is that going to continue to see the exploration and the drilling and the production of domestic resources versus going too low and maybe shutting those off?

Mr. HAMM. You know, we have a great supply. You know, I think we are all—I am a geologist—looking forward with natural gas.

I think we've got a 100-year supply or more. You know, I think we can produce 10 million barrels a day of crude oil for the next 85 years. You know, again this is an entirely new reservoir to explore.

Basically, what we've done in the past is explored what leaked off of these giant shale fields where the oil was generated. And so all we could do is maybe that 15 percent that leaked off into upper reservoir traps we could go after that.

Today, we can go into those resource beds like the Woodford and the Bakken and produce the oil left in them. So there's about 85 percent available. What can we get of that—20, 25, 30 percent? Sure.

Mr. UPTON. My time has expired. Mr. McNerney.

Mr. MCNERNEY. Thank you, Mr. Chairman. Your time has more than expired.

Excellent presentations. I really appreciate all of your words. Dr. Yergin, the financial disclosure of climate effects for oil companies—is that possible to make that happen? What would it—how would it affect the economy?

How would it affect the companies and how can we get that information to shareholders if they're not going to be able to produce that information?

Dr. YERGIN. I think a lot of that is being produced now. Companies are preparing their financial disclosure reports, their sustainability reports.

The question is does it go in the financial reports, does it go in others, and I think there's a process going on with the climate-related financial disclosures to get the right framework for meaningful information that's meaningful for investors. So I think we have pointed to something that's in process and being developed.

Mr. MCNERNEY. Thank you. Do you—in my opening statement, I mentioned the cyclical nature of the oil business economically. Do you see that happening now or do you think because of the shale revolution that it's going to flatten out a little bit?

Dr. YERGIN. No, I think—I think you hit it on the nail. It's a cyclical business. It's always been a cyclical business and if you look at the oil market today you see that we've gone from that really big surplus that led to the collapse with a tightening market and you have some very important geopolitical things that are happening.

One is the rapid decline and collapse in Venezuela in oil production, which is something that we can feel the impact of in the next several months.

Just to give you the numbers, Venezuela was 2½ million barrels 3 years ago. Today, it's 1.4. We think next year it'll be at 800,000 and could be lower than that.

And the other thing that's, obviously, with the sanctions coming on Iran, with a very different pacing by this administration and the Obama administration, right now there's uncertainty about that.

So I think, you know, whenever they say cycles have been abolished, I tend to think no.

Mr. MCNERNEY. Thank you. You know, I believe one of the big drivers to the shale revolution was the way that ownership of the minerals below the surface as handled in this country as compared to other countries.

Are other countries going to be able to carry on this—pick up the shale revolution or is that going to be continuing to be driven in this country?

Dr. YERGIN. Well, it's in Canada, but the kind of early thoughts that it was going to spread rapidly around the world has not borne out, partly for geological reasons, partly for political reasons, and partly for the reason you point to—that the resources under the grounds are owned by governments, not by the farmers who work on them.

I would say the area now that there's the greatest optimism about is what's called the Vaca Muerta, which means dead cow, which is an area of Argentina and that's where the focus is.

But so far, this is really a North American deal.

Mr. MCNERNEY. How about geopolitical leverage of our oil export and natural gas export versus what's happening as a result of us pulling out of Paris and sort of repercussions of us pulling back with regard to being a leader on climate change?

Dr. YERGIN. I think there are kind of two separate things. Obviously, Dr. Kennedy has described the latter.

But I am very struck when I go to a country like India to see that, to them, it's very significant that there's this whole new dimension to their relationship with the United States that we are exporting gas to them.

We are actually exporting oil to them and it gives a whole new strand to that relationship and a kind of dialogue that wasn't there before, and I see that in many countries around the world.

And I think that the—you know, I don't know where we are on trade right now but, certainly, LNG exports to China were seen as one factor that changed the trade balance between our two countries.

Mr. MCNERNEY. Thank you. Dr. Kennedy, could you give me some indication of the job creation per kilowatt hour equivalent of renewables versus oil and natural gas?

Dr. KENNEDY. I don't have those numbers off the top of my head. But I would be happy to sort of go back to the office and gather some of that information and provide it to you, yes.

Mr. MCNERNEY. OK.

Mr. Arriola, I am concerned about Sempra's design of selling off its renewables. Can you give me some clue where Sempra is with regard to that process?

Mr. ARRIOLA. I think what you're probably referring to, Congressman, is a shareholder proposal that we received in the last couple weeks from an investor group, and what I can tell is Sempra is totally dedicated and committed to continuing our focus with renewables.

In fact, if you look at—and you know our company, San Diego Gas and Electric, it's actually one of the leading companies that procures renewable power on behalf of our customers.

In fact, last year over 45 percent of the power that we procured was renewables and we are continuing to focus on what we can do from the battery storage technology standpoint in looking at electric vehicles.

So Sempra, at its core, is focused on sustainability and part of that is renewable energy as well.

Mr. MCNERNEY. OK. Thank you. Yield back.

Mr. OLSON [presiding]. The Chair now calls upon the gentleman from Texas, the vice chairman of the full committee, Mr. Barton, for 5 minutes.

Mr. BARTON. I thank the gentleman from Fort Bend County, Texas, and I can't tell you how excited I am to have this hearing. It's really exciting for me.

I've got all kinds of questions but I am going to—since I only have 5 minutes I am going to try to be as quick as possible.

Mr. Yergin—and this would be also for Mr. Hamm—what's—with current technology and current resource base, what's the upper limit for oil production per day in the United States as compared to Saudi Arabia and Russia?

Dr. YERGIN. Well, as a famous wildcatter in Texas said about around 1900, on Dr. Drill knows for sure. But I think now an informed view, and I think we see it from even the Energy Information Administration and others, the U.S. today is a little short of 11 million barrels a day.

It could be 14 or 15 million barrels a day. Russia is around 11 million. Saudi is, like, 10.3. So we are moving into this position very significant and, you know, you take the Permian in Texas, which Mr. Hamm referred to.

Eight years ago, it was 900,000 barrels a day. It's 2.5. We think another 5 years the Permian alone will be 5.4 million barrels a day, which will make it larger than any country in OPEC except for Saudi Arabia.

Mr. BARTON. Mr. Hamm.

Mr. HAMM. I don't have any change to that. Daniel is right on. You know, this year, best guess that we are going to grow about 900,000 barrels per day in the U.S.

So, you know, there's some infrastructure things out there that, you know, will cap some of that—that growth. But, you know, I don't see that number changing for a while.

Mr. BARTON. Is there any other country in the world that has a higher delta potential production increase than the United States?

Dr. YERGIN. Well, I will say that—

Mr. BARTON. I hope the answer is no.

Dr. YERGIN. The answer is no. I don't think anywhere in the world has actually seen the kind of growth that we've seen in the United States in the last 5 or 6 years. It just doesn't happen anywhere else in the world. It's breathtaking.

Mr. BARTON. What is China's potential oil and gas production as a percent of its demand? Do they have the ability to produce what they consume in oil and gas or will they—will they be a net importer of—

Dr. YERGIN. No, they're going in just the opposite direction we are. They are now importing 75 percent of their oil and I think IEA has just said next year they're going to be the largest importer of natural gas, which has become a real imperative for them.

So they're becoming more deponent and, you know, it's striking to see that part of their portfolio now is from the United States.

Mr. BARTON. This next question is for Mr. Arriola, since you're with Sempra. What's the 10-year outlook for LNG prices on the world market? I would assume they're going to come down as we ramp up our exports?

Mr. ARRIOLA. No, I think—Congressman, I think you're correct. I think what we are finding is that as demand externally continues to increase, there's more production going on here domestically and it's helping to actually keep prices relatively flat or actually continuing to push them down, and as we see additional advances in technology I think it's really good for consumers long term.

So what we are seeing in why countries on the outside are looking to buy U.S. natural gas is because of the stability of those prices.

Mr. BARTON. My assumption—of course, I am not in the market like you are, but my assumption is that as we ramp up our export terminal capability and capacity that those prices are going to come down, but they're going to level out, I hope, about halfway from where they were a couple years ago and where our domestic price is.

So if we can get it \$7, \$8 in MCF equivalent, I think—I hope it's somewhere in that range. Can U.S. exports be profitable in that price range?

Mr. ARRIOLA. What we are seeing from the market is that the demand is there, and Mr. Hamm knows probably better than anyone that the U.S. production market is continuing to look for more

natural gas and oil, which they wouldn't be doing it if it weren't profitable.

Mr. BARTON. This is my last question and I am going to sort of pat myself on the back here. You know, I helped lead the fight, and a lot of Members on the committee did, to repeal the ban on crude oil exports 3 or 4 years ago, and this committee also led the effort to make it possible to permit LNG terminals in a more timely fashion.

What's the geopolitical significance of those two congressional actions?

Dr. YERGIN. I think the geopolitical position is strengthening the United States and strengthening our position in the world.

I mean, it really gives us a whole new vocabulary to talk to countries about and the degree and a whole new category of kind of respect and a deeper relationship. So it's been proved to be, I think, very positive.

Mr. ARRIOLA. Congressman, what I would say to that is we talk to customers outside of the United States. They're looking for options. They're looking for options away from Russia and other countries and they want the United States to be one of those options.

Dr. YERGIN. If I could say one other thing—it also—there's a lot of contention in the relationship with China right now.

But this has taken one issue of contention off the table, because if you go back 8, 10 years, there would still have to be this zero sum game between China and the United States for energy. That's completely gone, and I think that's something that improves our position.

Mr. BARTON. Thank you, Mr. Chairman.

Mr. OLSON. Pat on the back complete. The Chair now calls upon Mr. Peters from California for 5 minutes.

Mr. PETERS. Thank you, Mr. Chairman. I thank the witnesses for being here. I will say hello to Mr. Arriola from San Diego, and congratulations on the SDG&E being at 45 percent.

I say it's the highest, the most renewable. If you know of a utility that's doing better you should—unless you know that, you should say it's the highest, not one of the highest.

Mr. ARRIOLA. We'll do that in the future. Thank you.

Mr. PETERS. OK. Thanks. Not that you're running for office.

You referred to clean natural gas in your testimony. I think that implicit in that is the statement that natural gas burns cleaner than coal, and I think most people would concede that.

The thing that a lot of folks say, though, is that a lot of the benefit of natural gas is lost because of fugitive methane emissions—that methane being a much more damaging agent to climate even than carbon dioxide in the short run.

The flip side of that is if you could contain it—if you could—if you could keep methane from escaping you could have a good impact on the rate of climate change.

Let me ask you kind of how do you think the United States is doing in terms of methane capture? And I would like you to address that—I am going to ask the same questions of Mr. Kennedy.

Mr. ARRIOLA. You know, it's a great question, Congressman, because I think with all of the advancements in technology and all of the capital expenditures that we've had within our industries

over the—I would say over the last 10 years, we have been able to identify and remediate substantially a lot of the methane emissions that come from the natural gas supply chain.

And so when you compare the United States—and this is based upon numbers that were coming out of the EPA, the United States is probably one of the lowest when you look at the overall supply chain—probably close to 1½ percent is the number that I've seen.

What I would tell you is that there are additional opportunities for us to be able to capture methane emissions that don't necessarily come from the natural gas supply chain but, rather, from the agricultural industry, the water supply industry, landfills, and within our company we are actually looking at new technologies to try to gather this and really create renewable natural gas by using it for either transportation fuels and/or reinjecting it into our pipelines.

So I think there's more opportunities there and we are focused on those.

Mr. PETERS. Just in terms of natural gas collection and distribution, it's my concern that the market may not provide sufficient incentives to look after that.

Mr. Kennedy, what do you—what would you tell me about methane capture?

Dr. KENNEDY. Thank you, Congressman. I would agree that both—that there are many of the technologies that are available and can be used to help contain and capture the methane leakage from the oil and gas industry but they are often not being used to the degree that they should be.

In a recent report just last week, some academic studies looking at the degree of methane leakage across the oil and gas industry are suggesting that it is much greater than EPA had been estimating.

I have not had a chance to look in any depth at that study but am greatly concerned that that is an indication that while CO₂ emissions are down because of the advantages on the combustion side between natural gas and coal that the methane leakage may in fact be using up much of that advantage or even all of that advantage.

I would also agree that there's opportunities for renewable natural gas from other sources. We have done some recent work on that. So there's other opportunities to capture other methane.

But the oil and gas industry has the ability, but needs a lot of attention to make sure that they really capture methane as they could.

Mr. PETERS. I would just say I would like to follow up with both of you or all of you about what we could do on that. I was invited to attend a conference held by Harvard Business School on America's unconventional energy opportunity, they called it.

It was in—it was in March of 2015—where they assessed that the cost of actually controlling this was very small in relation to the revenues and the profits.

But I don't—it just strikes me that we should come up with some regulatory regime because this is classic market failure, I believe, when the cost of capturing that few—that little bit of methane gas may not be sufficient to induce someone to keep it from escaping

and I think—I think, frankly, Sempra's been pretty open to that and I look forward to working with you.

Mr. Chairman, I yield back.

Mr. OLSON. Thank you. The Chair now calls upon Mr. Shimkus from Illinois for 5 minutes, sir.

Mr. SHIMKUS. Thank you, Mr. Chairman, and my colleague's line of questioning—from California.

I do want to make a point on the renewable natural gas that in the RFS in the advanced bucket there are credits for renewable natural gas.

That's actually a growing part of the advanced bucket of the RFS. So we should visit on that as we go down this route.

A question I have—I am going to focus on the refined products and exports for a minute and I would like to ask Dr. Yergin and Mr. Hamm what countries outside of North America do we ship refined products to?

Dr. YERGIN. Well, I don't have all of them in my head by any means. I know Latin America is a big source, sometimes Europe, perhaps even Asia.

I think in terms of LNG exports, I think so far we've exported LNG to about 26 different countries.

Mr. SHIMKUS. Mr. Hamm.

Mr. HAMM. Yes. You know, the refineries in this country, 30 percent of it is owned by foreign governments and entities and they can ship wherever they want.

They, basically, own those refineries. Much of it was built for their own oil, like the Canadians, Venezuelans, PEMEX. And so that oil, basically, is coming through, refined here and where it goes is any customer that they have around the world.

And so about 5 million barrels a day is refined products that go to those customers wherever.

Mr. SHIMKUS. Can anyone talk to me the difference between the, in essence, the refined product on the gasoline side for octane ratings the difference between the United States and the European market, and is there one? Does anyone know that?

We've been working on it. Bill Flores and I are—we are focusing on trying to revise the renewable fuel standard. As many of you people know, there is a push on looking at octane, and then the basic argument is this—why not get our smartest petroleum engineers and our smartest engine engineers to work together to figure out what's the best product. It addresses maybe a CAFE issue. It might address a little carbon issue.

So in our research we found out that in the United States our regular is 91 to 92 real octane number. The European gasoline is at a 95 real octane number.

So the question would be do you see any benefits of a kind of a unified octane standard in just markets as far as exporting refined product to the European market if we had the same octane standard as they would have?

My guess is that would be beneficial, just through simplicity of markets and commodity product. Is that farfetched?

Dr. Yergin.

Dr. YERGIN. This is new to me. I feel I need to go back and ask my refinery—my colleagues who work in refining that question and focus on it. I would be happy to—

Mr. SHIMKUS. Yes, I think—well, we are putting a lot of time to it and I would appreciate any smart people looking at this.

We are trying to address this—obviously, the White House is and the secretary of ag and the secretary of energy and the EPA administrator.

The industry is being whipsawed back and forth with different proposals and I think that's what happened when you don't have a legislative fix and a legislative schedule and agenda. So we have a lot of different stakeholders.

The last thing for—part of this is, and I direct this to you, Mr. Hamm, because we do talk about CAFE standards, and without a change in the fuel mix, as we are predicting, the way to reach CAFE standards is to have smaller lighter vehicles, which might address, one, safety issues for some, and then in rural America, a total rejection of—because we like big trucks, big engines, big power aspects.

Do you—if—in this issue of—do you see a—do you see a benefit in the aspect of CAFE if you have high-compression engines that can go further on the same amount of gas, as far as meeting CAFE standards?

Mr. HAMM. You can only go so far with that technology and manufacturers have done what they could with high-compression engines and fuel injection and everything that goes along with that, and what it came down to was the shadow of a car gets smaller and smaller and smaller, and it's rejected by the buyers in America.

So pretty soon everybody's buying SUVs. Everybody is buying pickup trucks or they're buying these little cars if that's all they can afford and putting their families in it.

But what we've seen is that we've reduced—we've reduced with seatbelts and airbags and everything else safety fatalities from 45,000 down to about 30,000, and that was the bottom, and now it's crept up due to the small size of these cars back up to 40,000.

So it's killing 10,000 Americans per year, and we have—that's the number of them because you have got a huge mix of bigger vehicles out there with these little cars. And they're made out of aluminum—they crush up like a beer can, kill everybody inside.

Mr. SHIMKUS. Yield back. Thank you, Mr. Chairman.

Mr. UPTON [presiding]. Mr. Tonko.

Mr. TONKO. Thank you, Mr. Chair. Earlier this month, Pope Francis met with some of the world's largest oil and gas companies to urge them to take the threat of climate change more seriously.

But the consequences of climate change are not just moral or environmental-based. Any of the world's largest investors say it is an economic concern as well.

Mark Carney, the Governor of the Bank of England and chair of the G-20's Financial Stability Board, has made it clear that businesses should be assessing and disclosing climate related risks.

A 2016 Black Rock Investment Institute report concluded that all investors should incorporate climate change awareness into their investment process and that advice is being heeded.

Investors representing trillions in assets have urge this sector to be more transparent and take responsibility for its emissions.

Dr. Kennedy, I listened as there was some discussion about shareholders in this whole arena, and shareholders have helped drive greater disclosures of companies' climate-related risks.

How important is it for shareholders to be given this information when making decisions on how to invest their money?

Dr. KENNEDY. This is a topic that I've not gone into in depth. But what I would say is that our economic system, our investment system, which is often driven by short-term returns, has a great difficulty in dealing with longer-term challenges and longer-term economic risks like climate change.

And so the more information that can be made available to investors about the implications of the investments and what those mean in the long term is going to be very important and very helpful.

Mr. TONKO. Thank you. And is there a risks to the United States economy if companies fail to make these disclosures?

Dr. KENNEDY. The risks of climate change itself are actually very great for the U.S. as we are already seeing significant impacts.

From the changing climate, from increased severe weather, from increased sea level rise, storm surge, a wide variety of impacts are already starting to show up and we can only expect those to continue to increase over time, particulate if we don't find ways of reducing emissions.

So the more that can be done from a variety of perspectives including in terms of how investment decisions are made is going to be critically important to address those real risks, going forward.

Mr. TONKO. Thank you. According to Semptra's 2015 corporate responsibility report, Semptra began responding to the annual carbon disclosure project—CDP survey—in 2006, which reports the emissions of major companies and releases and assessment of their potential climate risks.

Since 2015, Semptra has scored 100 out of 100 on disclosure. Mr. Arriola, why has Semptra made this a priority and do you believe that such disclosures are important across the energy sector?

Mr. ARRIOLA. Congressman, it's important to us because it's important to our consumers in the communities where we do business as well as to our shareholders.

As you have mentioned, there's been a trend I would say over the last decade that really started in Europe but now has come more forcefully to the United States where investors—and I am talking about large institutional investors—really do want to understand what companies are doing to address climate change, but not just climate change—how they're dealing with water, how they're dealing with diversity in companies—really, both sustainability and corporate responsibility.

And we—this is something that we take very seriously in our company and actually on Friday we'll be releasing our most recent sustainability report, which I think continues to get better and better and it gets acknowledged by different organizations because we go beyond what we need to because we think it's important for investors to understand what we are doing on their behalf.

Mr. TONKO. Thank you. And Mr. Hamm, Continental Resources is one of the largest non-responders to CDP's annual disclosure request. Any reason why you do not participate?

Mr. HAMM. Excuse me. There's not any specific reason. You know, climate change—I am a geologist. I believe that we can affect the climate and I certainly think that investors can pick or choose which company that they would want to invest in and who are the best stewards of the land and water, air.

Continental certainly fits in at the top of that rank. With horizontal drilling, there's a lot of drilling that goes on but it certainly doesn't look like it. You know, the methane emissions that you talk about, our company has been doing green completions as long as I remember. So——

Mr. TONKO. But that being said, why not then respond to CDP's annual request?

Mr. HAMM. You know, I don't believe we've had the specific annual request in that regard that I recall.

Mr. TONKO. OK. I yield back, Mr. Chair.

Mr. UPTON. Thank you. The Chair would recognize Mr. Latta.

Mr. LATTA. Thanks, Mr. Chairman, and thank you very much for holding today's hearing and thank you very much for our panelists for being with us today.

It's very, very important as we go forward with energy development in this country.

Mr. Yergin, if I can start my questions with you. You know, we on this committee have a great opportunity to speak with political leaders and business leaders across the world, and it's very interesting through the last several years I've had—the discussions I've had with those individuals they've all asked this one question—how is it the United States has been able to do what you have done and be able to accomplish it so quickly.

And then the next question would be is do we have any competitors or other countries that are out there that are trying to do the exact same, maybe to duplicate, you know, what we've done in this country and are they able to do that as we did in this country.

Dr. YERGIN. Do you mean in terms of the unconventional revolution or in general?

Mr. LATTA. Correct.

Dr. YERGIN. I think aside from what we've seen in Canada, which is kind of like an offshoot of here, no, nobody else, and it's a combination of the resource base, the ecosystem, our legal system, our entrepreneurial system and the fact that we have all these supply chains to respond to it.

So that's why, you know, it is something you look at and you say things don't happen normally this fast and this has really happened fast.

Mr. LATTA. Well, I know someone had asked a little bit earlier a question to you and you responded back about what's happening with Iran and in Venezuela.

Where do you see the United States—I know this has come up in some of the other questions—but when you're looking around the world—our place in the world, because it's hard to explain to people that don't remember the mid-1970s and understand what happened in this country, and trying to explain to people that, you

know, in some areas of the country either, A, you didn't buy gas on certain days because your license plate didn't end with a even or odd number, or, you know, people were just told we didn't any energy in this country.

But where do you—you know, where do you see this country and what that means for us geopolitically then?

Dr. YERGIN. I think it's—I mean, at that time the view was that, you know, we were just going to be held hostage—that we'd lost control of our lives on a daily basis in terms of gas lines and in terms of our economy, and this has been such a turnaround.

Ben Bernanke, when he stepped—was at our conference just after he stepped down as head of the Federal Reserve, said this unconventional revolution was one of the most positive, if not the most positive thing, to have happened since the 2008 crisis.

Clearly, people who don't remember, you know, it's—you know, they see grainy images maybe on television of gas lines and said, what is that all about.

So that's why it's such a big turnaround, and I think it took a few years psychologically for people to—you know, for many people to realize that this is for real.

Mr. LATTA. Thank you. Mr. Hamm and Mr. Arriola, what growth have your companies seen in job creation and career opportunities as a result of the shale revolution?

Mr. ARRIOLA. Sure. Starting at Sempra Energy, if you would have looked at our company just over 10 years ago, our LNG business really didn't exist.

So we've hired, I would say, hundreds of people to help develop our LNG projects in Mexico and Louisiana, and we are looking forward to hiring even more in Texas.

I think that's probably the biggest part. I can't give you an exact number but it's in the hundreds, of well-paying jobs.

Mr. LATTA. Mr. Hamm.

Mr. HAMM. Well, you know, our company, like a lot of independents, you know, we've had good growth over this period of time and the industry in total has added over a million jobs—you know, basically, every sector from the service sectors through B and P production and exploration, and so it's been a tremendous driver of the American economy.

Mr. LATTA. Well, I think what was just brought up is also important because I think that sometimes when we talk about a company and how many jobs are being created it's not all the folks out there who are, you know, in—on the steel end and those who produce the pipe, and you name all the different things that have to be done to get there, and so all of the other jobs that are the offshoots. So it's been a great boon for the economy.

Mr. ARRIOLA. Congressman, if I could also just interject that—

Mr. LATTA. Yes, absolutely.

Mr. ARRIOLA [continuing]. The jobs I was talking about were directly at Sempra.

Mr. LATTA. Right.

Mr. ARRIOLA. If you look at the projects that we've had—for example, our Cameron LNG facility—there are over 10,000 people on the job today. Once we develop our Port Arthur facility, there will be over 3,000 jobs going for 4 to 5 years.

So it's not necessarily just the jobs directly at our company that are important from an economic perspective but it's all of the jobs that get created by these projects.

Dr. YERGIN. We calculated a couple of years ago that it was well over 2 million jobs because the supply chain in the Middle West that was a very big beneficiary because of the supply chains, because of the manufacturing capabilities that fed into this.

Mr. LATTA. Thank you very much, Mr. Chairman. My time has expired.

Mr. UPTON. The gentleman from Texas, Mr. Green.

Mr. GREEN. Thank you, Mr. Chairman and the ranking member, for holding this important hearing, and I am glad to know that the World Gas Conference is here in Washington.

Dr. Yergin, I remember a few years ago we had one of our conferences in Houston and you interviewed our EPA administrator, Gina McCarthy, and I think that was the first time she went to an energy conference, and I appreciate the hospitality and also representing an area that deals with environmental issues every day because that's our job base, our refineries, our chemical plants in east Houston and Harris County.

So Texas is the largest generator of wind power in the country right now and, hopefully, we can do other things. But what we've seen, though is that the mix of the electricity—and we do need electricity plants to produce those for those electric cars—and, you know, our choices are in Texas we have 20 percent nuclear power.

That's the base power. You know, wind energy—coal has actually gotten down lower because the price of natural gas is so cheap and that's why it's—I think that mix works and we'll continue to see renewables pick up some.

But it's easier to turn on a burner on a natural gas plant than it is to try and keep a coal storage facility.

The—our American energy renaissance—because I've been in Congress since 1993 and it's been amazing what's happened. Mr. Arriola, in your testimony you talk about how the U.S. regulatory certainty at FERC could hinder U.S. LNG development in comparison to countries like Russia, Australia, Qatar, or Mozambique. What changes would you like to see in the regulatory process?

Mr. ARRIOLA. Thank you, Congressman. You know, I think we believe that it's important to have a very thorough and exhaustive review process on any permitting, especially from FERC and the DOE.

What we'd encourage is just making sure that it's as streamlined as possible—that it's efficient but that we check the box as quickly as we can—that we don't recreate the wheel on every project, and I will give you an example.

When we went through the process for our facility in Cameron, Louisiana, it took FERC 553 days to get through the entire project.

As we are seeking approval here for our Port Arthur LNG facility in Texas, it's essentially the same engineering design that we are trying to duplicate in Texas. Right now, we are estimating that it's probably going to take closer to a thousand days.

Now, granted, there are more projects that FERC is looking at and we've been working very constructively with their staff and everything.

But I think part of it is just making sure that they have not just more resources but the right resources and that the agencies like FERC and DOE work together to eliminate the bottlenecks to the extent that they can.

Mr. GREEN. Right now I've been told—and if you could confirm it—the Trump administration's approval time line for LNG export permitting trails that of the Obama administration. Is that correct?

Mr. ARRIOLA. That's our understanding.

Mr. GREEN. I think that would shock a lot of us.

Mr. ARRIOLA. Yes.

Mr. GREEN. And I want to make sure that FERC has the staff it needs to move efficiently through the permitting process.

I've also—in fact, this committee passed legislation on cross-border pipelines to sell natural gas from Texas or New Mexico to Mexico, and Mexico has—literally, can only refine about 60 percent of their petroleum they need for diesel and gas and 40 percent of that comes from typically the refineries along the Gulf Coast.

The Eagle Ford Basin doesn't stop at the Rio Grande River either and there'll come a time in the future that Houston's petrochemical industry may need the gas from Mexico and those pipelines could benefit us in our industry and east end.

Mr. Mullin and I addressed this with the cross-border pipeline that passed the House last summer, and I am pleased that Senator Hoeven introduced companion language in the Senate last week to move it quickly to conference.

Mr. Arriola, could you speak how our energy relationship with Mexico has shifted recently? What benefits does the U.S. stand to gain from an integrated North American energy market between Canada, Mexico, and the United States?

Mr. ARRIOLA. Sure, Congressman. I think it's—you know, this truly has been a win-win situation between the United States and Mexico as it pertains to energy trade.

In fact, in the most recent year that I've seen the numbers, there's actually been a trade surplus from U.S. products and services related to energy that go to Mexico.

In fact, I think the last number what I saw was, roughly, an \$11 billion surplus on the side of the U.S. We are continuing to provide them with natural gas. We are continuing to provide them with other petro fuels sources, for example.

If you look at gasoline, diesel, and other jet fuel resources, the United States has, roughly, a 90-day inventory supply. Mexico has two to three days.

So there are more opportunities to build infrastructure in Mexico that can receive future U.S. products and that's one of the things that we are looking at.

Mr. GREEN. Mr. Chairman, I know I am out of time but if—

Mr. UPTON. We are going to have votes on the House floor shortly. So—

Mr. GREEN. OK. Well, I was just going to say that it's not just Mexico. It's also LNG exports. In fact, my joke is anybody in Louisiana and Texas who has a five-foot ditch off the Gulf of Mexico they want an LNG export facility.

Thank you, Mr. Chairman.

Mr. UPTON. Gentleman's time has expired. Mr. McKinley.

Mr. MCKINLEY. Thank you, Mr. Chairman. Thank you for holding this meeting.

As Dr. Yergin noted earlier in his testimony not only this time but previously, there is indeed an abundance of natural gas located in the Marcellus and Utica shale gases in West Virginia, Ohio, and Pennsylvania, and it's estimated that this region will produce about 37 percent of the Nation's natural gas production by the year 2040.

These shale gases underscore this potential of a historic renaissance that he referred to in American energy. But as we've heard earlier, the naysayer continue to trot out their tired, disproven talking points.

Unfortunately, the facts have proved otherwise. Just the last 10 years, CO₂ emissions in America have gone down by 20 percent.

Shale gas has given the Appalachian area a breath of fresh air, perhaps a chance finally to transform and revitalize a whole region of the country, and subsequently Rick Perry and the DOE have concluded that there's a need, perhaps, to develop a second petrochemical center located in the Appalachian region.

A recent study by HSS Market have concluded that the economic advantages of extracting ethane in the Appalachian region—has concluded that the resin could be produced at 23 percent lower there than being shipped down to the Gulf Coast to the crackers and back up. So I think that was an interesting conclusion with that.

Now, we can achieve lower energy costs and dramatically decrease it if we take a different approach and work together.

Congress should fully innovate research to reduce emissions—the concern, Dr. Kennedy, you're concerned about—if we just put the money into research.

The technology of American scientists developing higher efficiency and low emissions could be sold around the world—marketed around the world—and thereby address this worldwide concern about greenhouse gases, because we've got to remember the world is going to increase its energy production and use by 28 percent by 2040, and fossil fuels by will count still for 75 percent of the energy use.

So what my concern is, if that's the case, what are we doing with China and India? Isn't it time that some of our Members recognize that, until the rest of the world—especially India and China—produces electricity more cleanly, continuing to overregulate fossil fuel in America will have virtually no effect on the global environment.

Therefore, shouldn't we be first—innovate first, do the research, then regulate?

So, Dr. Yergin, with this shale gas present, this revolution going on in Kentucky, Ohio, and West Virginia, what potential do you see for a potential petro chemical industry up in the Appalachian area and with projection they're saying as much as \$36 billion invested and maybe 100,000 jobs? Do you believe that.

Dr. YERGIN. Some people see the Marcellus, now the region in the Utica as the largest gas field or gas concentration in the world.

I thought that some companies had actually committed to build petro chemical facilities there. I thought Shell was doing it but you have a—

Mr. MCKINLEY. Shell is doing it in Monaca, Pennsylvania. That's one portion of it, but there are others. I know they're doing some—the ethane storage hub that we've been promoting here has been the—the question is whether or not any of you have the realization that could this be a center of a secondary?

We are not trying to replace Houston, but just is there a secondary—is there a second—possibility of a secondary?

Dr. YERGIN. Yes. Sure. I mean, the resources is so enormous there. I mean, as you said, it's going to be such a large part.

Also, I did want to say—you mentioned the R and D. One of the big themes over at the World Gas Congress has been specifically about methane and applying the technologies to address methane.

So, I mean, there is definitely a research agenda to address the questions you're talking about including methane.

Mr. MCKINLEY. Dr. Arriola, any comments from you?

Mr. ARRIOLA. I really don't have anything to add on that other than given the infrastructure that we have and lacking pipelines in some parts of our country, it may make sense to develop those centers that you're talking about closer to the source themselves.

So from an economies of scale standpoint, that could very well make sense.

Mr. MCKINLEY. Thank you, and I yield back my time.

Mr. UPTON. Gentleman yields back. The gentleman from Vermont, Mr. Welch.

Mr. WELCH. Thank you very much. I thank the panel.

Mr. Yergin, your opening statement indicated with the shale gale it just has been a huge game changer in jobs and economic activity in our ability to go from being an importer to an exporter, maybe the largest one.

One of the other issues, though, that I would like to focus on is energy efficiency. I mean, it's tremendous that we have these resources and it creates the economic activity and the jobs.

But some of us are concerned also about carbon emissions and the impact that has, and my understanding is that the energy efficiency policies that we've been able, and I've worked a lot with Mr. McKinley on this actually—energy efficiency has allowed us to save on the demand for energy.

The Alliance to Save Energy says that if we tried to run today's economy without energy efficiency improvements that have taken place in '73, we'd need 55 percent more energy supplies than we now use.

Could you describe what you understand to be the Trump administration policies on energy efficiency, A, and, B, whether even as we exploit the shale gale, does that suggest that we can take our eye off the importance of efficiency?

Dr. YERGIN. I am not really in a position to address what the—you know, because I haven't studied what the Trump administration's specific policies are.

I do agree with you. When I began my work in energy, it was based—focused on energy efficiency and, off the top of my head, I would say that we are probably twice as energy efficient today as a country than we were, you know, a few decades ago.

So I think energy efficiency is a very important—you know, I regard energy efficiency as another energy source.

Mr. WELCH. And my is the energy companies have to be part of the solution. They have to be, and I am wondering—you're over at the meeting with the gas folks—12,000 people—are there any topics that are being discussed specifically as to energy efficiency?

Dr. YERGIN. Well, in the speeches I heard, it was certainly said that, you know, this has to be a big part of the energy mix and, you know, if we hadn't become more efficient as a country, we would be in a—we would also be in a very difficult place.

The thing about energy efficiency so much, it's—you know, it's—it goes through the entire economy. It's decisions that people make when they build houses.

It's new processes in industry. What's always struck me about it, it's a very decentralized activity. There has been a general trend towards being more efficient.

Mr. WELCH. Is there a place for appropriate regulation in order to meet energy efficiency standards, Mr. Yergin?

Dr. YERGIN. Yes. I mean, you can see it, for instance, in housing and other places and that regulation has been part of the mix.

Mr. WELCH. Thank you. Mr. Arriola, would you agree with that, I mean, as the representative of a major energy company?

Mr. ARRIOLA. Yes. What we see, Congressman, is a lot of that regulation happens State by State. So, for example, in California, whether it's the housing codes or through our Public Utilities Commission, there's a lot of work that goes on in energy efficiency.

Mr. WELCH. So, you know, there's—

Mr. ARRIOLA. And our companies are directly involved to help facilitate that.

Mr. WELCH. All right. Mr. Hamm, I know you have been supportive of the president's deregulatory agenda. We've heard some testimony here about the appropriate use of regulations like Energy Star.

Do you support that?

Mr. HAMM. Well, you know, the best efficiencies is gained by the private sector. For instance, in 2014 we had 1,950 rigs working. Today, we've got a thousand rigs doing the same job.

So, basically, you have got one rig as efficient as five were in the 1980s. So that's efficiencies that you can gain from the private sector —

Mr. WELCH. Well, that's efficiency in the exploitation process, not in the use process, right? Now, do you believe that EPA has a role—the Environmental Protection Agency—in promulgating appropriate regulatory mechanisms for energy efficiency?

Mr. HAMM. I don't think they—EPA is there to enforce the law and basically ensure that rule of law is followed, and so they have that job to do and they do it sometimes very well, most of the time very well. But as far as efficiencies—

Mr. WELCH. Right. I just have time for one more question. What's your view on the president's tariffs on oil exports to China—or the China retaliatory tariffs on us with respect to our oil exports?

Mr. HAMM. Well, right now, we don't have tariffs that apply to oil going to China, and we'll see if that happens or not.

Mr. WELCH. Are you OK with the tariffs? Do you think that's a good thing for business?

Mr. HAMM. Am I OK with tariffs? I think tariffs are counter-productive. I think everybody here believes that.

What's going on right now is setting some of that straight. You know, the countries have gotten too carried away with tariffs in the past. Nothing was done about it, and so some of those corrections are being made today.

Mr. WELCH. I yield back. Thank you.

Mr. UPTON. Gentleman's time has expired. Mr. Griffith.

Mr. GRIFFITH. I thank the gentleman and appreciate it. Dr. Yergin, appreciate you being here today. I got a couple questions in that regard with the geopolitical aspects of all of this.

So we've heard a lot about foreign countries, and Mr. McKinley touched base on it, and we were talking with one of the foreign countries earlier today.

But isn't it true that if we were suddenly to cut off American gas exports that a lot of the countries, particularly some of the developing economies, would just continue to use coal from other parts of the world?

Dr. YERGIN. Well, I think—I mean, we are just part and we are still a beginning part of the LNG market. We'll have more when you guys get going.

But I think there is—you know, there's a competition going on on a global basis for, you know, what's going to be the balance between coal and natural gas and renewables for developing countries, and I think many of them—you know, there's definitely a push towards using more gas.

We see 15, 20 countries are going to—that don't import LNG now will import LNG because they want to have—clean up and not use—clean up their electric generation.

Mr. GRIFFITH. And one of the questions that I would have as we look at this is as we go to using the LNG, are we able to compete worldwide with that?

Because, obviously, and I represent a coal district like Mr. McKinley does as well—obviously, you know, it doesn't make sense very often unless you need some good high-quality, as they called it this morning, coking coal.

But the—what we call metallurgical coal in my neck of the woods—unless you need that, if you're just buying steam coal, it's hard to buy that for basic energy in some parts of the world—hard for us to ship it to them and compete against the Australians, and insert about four or five other countries.

But from what I understand—you correct me if I am wrong—our LNG resources can reach worldwide and be pretty competitive wherever we go. Isn't that true?

Dr. YERGIN. Yes. We are quite competitive in the market. You know, we are maybe not as competitive as some pipeline suppliers in Europe.

But there's definite—I mean, I saw it this morning at this APEC conference with all these Asian countries. They're really interested in important LNG from the United States.

Mr. GRIFFITH. And I think that makes a lot of sense, and as a part of that, I would have to say that while I don't have any of the Marcellus.

DOE, earlier this year, announced a project in conjunction with Virginia Tech in my district to investigate the resources—the resource potential for reservoirs in the Nora Gas Field in southwest Virginia, and I am excited that this research is being conducted to improve our understanding.

But it appears that we are down another level from what they've looked at before and so they're drilling some deep mines or some deep wells to see what we have down there, and we are excited about that because we have coal bed methane but we haven't been doing much on any other gas.

We don't have the Marcellus or the Utica shale. But we may have this and we are excited about that. We already have some petro chemicals—Eastman Chemical, even though it's in Kingsport, Tennessee, and people say, why are you interested in it.

They have 10,000 employees and a thousand of them drive the eight miles from my district to the plant. So we are excited about that.

But I think it's important that we realize that, as we move forward, this is important for the world. I also would echo some of the comments my colleagues have made that we need to do the research, because it's not just the United States that we are dealing with.

It's the world and we are looking at global warming, et cetera. If we don't provide the research to burn our fuels more efficiently worldwide, and something that the rest of the world can also afford and obtain, then they're going to continue to burn coal.

They're going to continue to burn all kinds of products and put stuff in the air, and I know it bores people but it's just my favorite factoid of all time.

NASA did a study. They followed a sandstorm from Central Asia in the middle of the Gobi Desert, and it takes 10 days for the air to get from the middle of the Gobi Desert to the eastern shore of Virginia, based on their satellite research.

So we need to work on this from a worldwide viewpoint and not put American jobs out of business because we are trying to set the standard, because the rest of the world is looking for jobs, period, and if they have to use something improper or less efficient they'll do it.

But if we can find a way to do it through research they'll share in that. Everybody wants to have a cleaner world, but they want to have jobs first because the number-one—the number-one thing is to have jobs and that helps your health as well.

Wouldn't that be correct, Dr. Yergin?

Dr. YERGIN. Yes, and I love your factoid. I've never heard that before.

Mr. GRIFFITH. It's a fun factoid. All right. I yield back.

Mr. UPTON. Mr. Walberg.

Mr. WALBERG. Thank you, Mr. Chairman, and thanks to the panel for being here.

Mr. Yergin, in your testimony you mentioned that by 2025 as many as 4 million jobs—direct, indirect, and induced—could be supported by unconventional oil and gas activities.

Could you explain in further detail for us the types of jobs that are supported by unconventional oil and gas activities?

Dr. YERGIN. Well, those three categories are really categories that the Department of Commerce uses. The direct jobs would be working on one of Harold Hamm's rigs, working in the oil field.

Indirect would be kind of service jobs supporting that, and then the induced jobs is the money that flows into the community because, as we've seen in Pennsylvania, suddenly people are able to buy cars, are able to buy houses.

Realtors service computer specialists in California, financial people in New York, and so that's kind of the methodology that's used for estimating that, and what it really says that these supply chains go all the way the across the country and the money that's being spent is staying in this country and being distributed in our economy.

Mr. WALBERG. Moving along with that, several of you mentioned the numbers of jobs—direct, indirect, in construction as well as exploration for finding all that go on there.

Let me ask Mr. Hamm and Mr. Arriola, what types of job training and recruitment efforts are you using to meet those needs?

I mean, we see all across the vocational spectrum today a real lack of people to do the jobs—real rural jobs that we need—and what are you doing to train people for the jobs?

Mr. ARRIOLA. Congressman, I can tell you, in the case of the LNG facilities that we are talking about, we work very closely, obviously, with our subcontractors that are hiring people but we are also working directly with the trades to train people, whether it's welders, whether it's supply procurement experts.

There's a whole host of jobs, whether they're low skilled or high skilled that we are trying to do, and I think one of the great things is we are creating a pipeline of skilled workers that—especially in some of these areas that workers that wouldn't necessarily have opportunities that can now go from facility to facility to continue to build.

So sometimes we think of these as temporary jobs but they're really skills that are being developed that can be utilized across the construction industry to continue to build energy infrastructure.

Mr. WALBERG. So you're working with the trades. What other—I mean—

Mr. ARRIOLA. We are working with the trades in the case of our utilities where we are enhancing pipelines to carry natural gas.

We are working with the junior colleges and other organizations to identify people that are coming directly out of high school or junior colleges to give them the skills that they need to be able to be productive members of our team.

Mr. WALBERG. Mr. Hamm, I would ask you if you'd respond as well, especially since being an innovator—innovation in directional drilling and all of that.

Mr. HAMM. Thank you. What we've seen, really, that added so many new jobs is these very expensive petro chemical plants that have been added with all the natural gas resources that we have.

In fact, it's been estimated that one out of eight people, you know, have been associated with our industry. So it's very intense, particularly in Houston and some of the areas that these plants locate.

And so it's very intense. Vocational technical training has helped a great deal in places like Oklahoma. As far as our industry goes, it's been a great resource.

But it seems like the—you know, we are down to about 3.8 percent of unemployment in this country now, which is wonderful, and the closer you get to the 3 percent level, the harder it is to find those employees that you need.

But so far, we've been able to do it.

Mr. WALBERG. Recruit and train your own? Is that how you—

Mr. HAMM. We recruit and we've trained. We train both at the company level and then also we use technical schools for training as well.

Mr. WALBERG. Thank you. I yield back.

Mr. UPTON. Mr. Duncan.

Mr. DUNCAN. Thank you, Mr. Chairman. Thanks, everyone, for being here. It's been a great hearing so far. As we all know, the United States is well on our way to becoming a net energy exporter by 2020—I think a natural gas exporter—it was the first time last year—first time since 1957, I believe.

I commend the Trump administration's support for robust domestic energy production, which has consequently strengthened our leadership on the world stage.

Mr. Arriola, you note in your testimony that the failure of the U.S. to seize the current LNG opportunity has international implications.

I couldn't agree with you more, and besides the fact exporting gas to U.S. allies will contribute up to 452,000 American jobs from 2016 and 2035, add about \$73.6 billion annually to the U.S. economy. It can also provide energy security to our allies.

Prior to serving on the Energy and Commerce Committee, I served as chairman of the Western Hemisphere Subcommittee on the House Foreign Affairs Committee and I utilized that role as that chairman to focus on energy opportunities in North and South America and how we can work to achieve not only America energy independence and energy security but also hemispheric energy security and independence.

In this region of the world, we have the ability through U.S. LNG exports to help the energy poor. Countries reduce their dependence on corrupt state-owned regimes and increase the quality of life for so many people around the world.

I talk about quality of life a lot of times, how energy can improve the quality of lives. Just in infant mortality rate—through energy and a constant 24/7 baseload power supply that that energy, possibly with LNG natural gas-fired power plants providing that electricity can keep babies alive. Where you have intermittent power now in neonatal intensive care and incubators cannot run to keep those babies alive, you see a high infant mortality rate.

A lot of quality of life issues that we, as Americans, with our energy—abundant energy resources, exporting those to our friends and allies around the world to improve the quality of life of folks elsewhere.

So, Mr. Arriola, from your perspective, how can LNG terminals further open up access for U.S. LNG in these markets?

Mr. ARRIOLA. Well, Congressman, your point about natural gas and different types of energy impacting more than just the economic side is truly right on.

In fact, I saw—I spoke to a professor from the Stanford Natural Gas Initiative yesterday and he shared with me in a conference we were at that, although we don't talk about it very much, indoor air pollution is one of the largest killers in this world, and we don't think about it here in the United States because we have, for the most part, natural gas or electricity to help, from a cooking fuels perspective.

But if you go to other countries—developing countries, they use wood. They use dung. They use charcoal, and last year, roughly, 4 million people died from indoor air pollution caused by cooking fuel.

Mr. DUNCAN. And I am glad you said that. I talk about that all the time. The indoor air quality is terrible when you're burning on wood, charcoal, dung, other things that people around the world have to cook on, and the fact that they don't have a 24/7 baseload power supply to keep their food fresh in a refrigerated environment.

Mr. ARRIOLA. So not only are we impacting economic prosperity around the globe by being able to export clean U.S. natural gas, but we are changing people's lives. We are changing the health and their livelihood.

Mr. DUNCAN. Improving lives of so many people around the world through American resources that we take for granted. We take for granted that that light is going to come on when we flip the switch.

We take for granted that the machines of industry to produce the widgets that America produces—that that electricity is going to be there to provide for those machineries to turn on.

But you know what? It's not just a third world problem. Even in second world and first world Europe they have problems with intermittency and power supplies.

So this is geopolitics of American energy. When I was in Spain—and I understand Portugal is the same way—but they want to be the LNG importer for Western Europe because right now, Western Europe is relying on who? Russia.

Russia is a gas station masquerading as a country. But they're providing that natural gas to Europe and they use the levers of influence of turning that spigot on and off to affect policy not only in Eastern Europe but in Western Europe, and as those pipelines continue to be built to provide that natural gas, Western Europe is looking west to the United States, a stable energy producer, an ally and a friend, to provide LNG so they can meet their energy needs and lessen their dependence not on the Middle East for their energy but lessen their dependence on Russia and their less dependence on Russian gas and more strong dependence on, possibly, hopefully, American LNG exports to provide that energy.

So the geopolitics are real. I appreciate your comments, and let's improve the lives of folks around the world through American energy production.

With that, Mr. Chairman, I yield back.

Mr. UPTON. The gentleman yields back. I regret to say that votes on the floor have started again. They're not going to be completed, they tell us, until after 4:00 o'clock.

I know a couple of our witnesses have to leave by 3:45. So I am going to ask that Mr. Olson, who's next in line for questions, take the chair and he will ask questions, at which point we will adjourn, and those Members wishing to still ask questions will do it in writing, and if you could respond on a timely basis we'll adjourn rather than keep you here until 4:15, knowing that all of you are pretty much gone.

Mr. Olson.

Mr. OLSON [presiding]. I thank the Chair, and welcome to our four witnesses.

I want to start by saying congratulations to our friends at—our good friends at Sempra. Big merger with Oncor. Congratulations.

Mr. ARRIOLA. Thank you.

Mr. OLSON. Mr. Arriola, your company is working on some significant LNG export terminals along the Gulf Coast. You mentioned Cameron being up and running, Port Arthur coming online.

Can you talk about why getting American liquefied natural gas to market is time sensitive? Why does it matter how fast we ramp this production up? What markets are in jeopardy if we delay or drag this out?

Mr. ARRIOLA. Sure, Congressman.

I think, as we've discussed, when foreign countries decide to enter into contracts for LNG, they're ordinarily in the 20- to 30-year timeframe. And so as I am buying a product or a service for 20 or 30 years, I don't need to come back every year and re-up.

And so as U.S. companies, including Sempra, look at building a project, whether it's in Cameron or in Port Arthur, we are really focused on trying to get all those contracts together up front so that we can get them financed and to build the project.

If we can't get those projects this year or next year because somebody else has already signed up these 20- to 30-year contracts, we are out of the market, and the construction jobs that we've been talking about and the impact to the local economy goes away, or never develops, I should say.

Mr. OLSON. Yes. Thousands and thousands of American jobs. Mr. Hamm, the people back home in Texas 22 want me to thank you for your efforts in the Bakken shale play to change the entire world and America's energy future.

We are now an energy dominant country because of you, Mr. Hamm, and a Texan named George Mitchell at the Barnett shale play.

My question is, can you talk about the most important actions that the Trump administration can take to help you with oil and gas production?

You mentioned adjusting the CAFE standards, ACC. How about public lands, capturing other things? What can we do to help you out and make sure this production continues and doesn't get stifled by Washington, DC?

Mr. HAMM. Well, we have a friendly audience here that listened to us today, which is good. We need to do a lot with Federal lands.

They should also participate in this energy renaissance, and they haven't up to this point.

The bulk of what has been done has been on fee lands, particularly in the Bakken and Texas, and we need to get it where permitting could be done rapidly instead of waiting, you know, 6 months to a year, and so that's one thing we are working on that.

And we have an audience that's listening and wanting to do the right thing. So I think we are moving in the right direction. We just need to keep the ball rolling to get it corrected while we are doing it.

Mr. OLSON. Yes, and thank you for your example of what the private sector can do. The private sector developed directional drilling and hydraulic fracturing.

That wasn't something that came from DC. That came from Harold Hamm and George Mitchell. So thank you for that.

My final question is for you, Dr. Yergin. Let's talk about CERAWeek. It used to be CERADay, maybe CERAHour in 19, what, 83? You got that ball rolling, and now it rolled into the energy capital of the entire world—Houston, Texas.

Your testimony mentioned how the revolution in shale oil and gas—the shale gale—has had enormous impact on our relationships abroad.

I've seen that firsthand. You mentioned India. I went there this past March. Their motto is, natural gas for today—renewables for the future.

But as you mentioned, right now they've signed a contract for 20 years of liquefied natural gas I think somewhere about 14.4 million metric tons from America to India. That helps them get their air cleaner. It helps them where they want to go.

Also, as you mentioned, they've got, I heard, 2 million barrels of American crude oil that they haven't had for almost 50 years. They are taking the wood to OPEC and Russia with our energy.

And so my questions are can you tell me more details about what that means for allies? We can help out India. We can help out South Korea, Japan, even help out China getting their air cleaner. How can we use this energy renaissance to make the world better?

Dr. YERGIN. I think, first of all, by helping to reduce conflict.

Secondly, I think it builds confidence. I think it really—what's happened here in the United States is actually a big contribution to energy security for the whole world and we benefit from that.

So I think it radiates out from it, and I think what you described in India—I've seen it in other countries, too—it gives a—they have a deeper relationship with the United States and it connects them more to us, and I think that's very beneficial for our overall political situation in the world.

Mr. OLSON. One example—Mr. Shimkus signed this poster on the floor last week—this big tanker ship called Independence was pulled into Lithuania.

Probably 500 people—normal people from Lithuania—were greeting this tanker ship going, "Yay! Yay!" That's because they know that takes Mr. Putin's weapon away from him forever.

Dr. YERGIN. Well, I think it's true that what's happened with LNG to Europe—and it's not only us but from others—it's really,

in a sense, depoliticized—it turns Europe more into a gas market and takes out the kind of political implications for it.

So I think it's something that's very welcome in those countries—that they know that we are there and we are their friend.

Mr. OLSON. I am out of time.

Just one warning, sir—my Houston Astros will beat the Boston Red Sox again this year, going for the World Series.

Dr. YERGIN. What a forecaster.

[Laughter.]

Mr. OLSON. Pursuant to committee rules, I remind Members that they have 10 business days to submit additional questions for the record.

I would ask that witnesses submit their answers—their responses—within 10 business days upon receipt of those questions.

Without objection, this subcommittee is adjourned.

[Whereupon, at 3:36 p.m., the committee was adjourned.]

[Material submitted for inclusion in the record follows:]

PREPARED STATEMENT OF HON. BOBBY L. RUSH

Thank you, Mr. Chairman, for holding today's hearing.

Mr. Chairman, I have repeatedly signaled my support for an all-of-the-above energy portfolio, however, I feel this hearing represents a missed opportunity.

Instead of simply focusing on oil and gas production, I believe a more worthwhile topic of discussion should be centered on shifting geopolitics based on the American energy landscape, as a whole.

Mr. Chairman, I believe there has indeed been some beneficial impacts of exporting liquified natural gas (LNG) and crude oil to friends and allies who are now becoming less reliant on Russian energy supplies.

I also support supplying Caribbean partners, including Puerto Rico and the U.S. Virgin Islands, with LNG in order to help them rebuild their energy infrastructures in a more sustainable and efficient manner.

However, we should be examining the larger picture of our domestic energy portfolio, including the benefits of investing in renewable energy and even energy efficiency initiatives.

Mr. Chairman, by taking this holistic approach we are better able to examine the benefits that clean energy and energy efficient technologies have on our economy, as well as their positive impacts related to the serious issue of climate change.

Mr. Chairman, by most accounts, the country that innovates and develops the clean energy and energy efficient technologies of the future will have a leg up in all of the economic benefits that come with selling these advancements to countries around the globe.

However, instead of maintaining our global position as the world leader in clean energy investment, development, and research, the Trump administration has taken a series of misguided policy calculations that have ceded this number one ranking to the Chinese.

Unfortunately, this short-sighted and backwards-looking perspective is costing our economy jobs and business opportunities that other countries are gladly claiming.

Mr. Chairman, a smarter discussion of America's energy future should include a more comprehensive examination of all of the many resources we possess in the country.

That discussion should include not only the safe and responsible production of domestic fossil fuel energy sources, but also all of the economic stimulus and job creation associated with moving towards cleaner and renewable energy sources of the future, as well as additional conservation and energy efficiency measures.

Mr. Chairman, the American people are never content to sit and back and follow someone else's lead.

No, instead, our constituents expect us to enact policy and make investments that help solidify our forward-looking leadership in the world and show others what is possible.

It is high time that, as elected representatives, we exemplify the foresight and audaciousness that has come to define who we are as a people, and the energy sector is the perfect place to make that mark.

So I look forward to hearing from today's witnesses and I hope that we can have a balanced and honest debate on this issue.
Thank you, Mr. Chairman, and I yield back the balance of my time.

GREG WALDEN, OREGON
CHAIRMAN

FRANK PALLONE, JR., NEW JERSEY
RANKING MEMBER

ONE HUNDRED FIFTEENTH CONGRESS
Congress of the United States
House of Representatives
COMMITTEE ON ENERGY AND COMMERCE
2125 RAYBURN HOUSE OFFICE BUILDING
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Minority (202) 225-3841

July 20, 2018

Dr. Daniel Yergin
Vice Chairman
IHS Markit
1300 Connecticut Avenue, N.W.
Washington, DC 20036

Dear Dr. Yergin:

Thank you for appearing before the Subcommittee on Energy on June 26, 2018, to testify at the hearing entitled "The Shifting Geopolitics of Oil and Gas."

During the hearing, Members asked you to provide additional information for the record, and you indicated that you would provide that information. To facilitate the printing of the hearing record, please respond to this request with a transmittal letter by the close of business on Friday, August 3, 2018. Your responses should be mailed to Kelly Collins, Legislative Clerk, Committee on Energy and Commerce, 2125 Rayburn House Office Building, Washington, DC 20515 and e-mailed in Word format to kelly.collins@mail.house.gov.

Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,



Fred Upton
Chairman
Subcommittee on Energy

cc: The Honorable Bobby L. Rush, Ranking Member, Subcommittee on Energy

Attachment

Reply to question from Congressman Shimkus from the June 26, 2018, hearing of the Subcommittee on Energy:

Thank you for the question from the Honorable John Shimkus. The issue of a unified octane standard is a complicated matter, with multiple pathways that might be explored to bring U.S. standards into alignment with international and European gasoline standards. In our view, more study is needed to understand an economically optimal solution and to supply consumers in an economical and sustainable manner.

Daniel Yergin
Vice Chairman
IHS Markit

GREG WALDEN, OREGON
CHAIRMAN

FRANK PALLONE, JR., NEW JERSEY
RANKING MEMBER

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July 20, 2018

Dr. Kevin Kennedy
Deputy Director, U.S. Climate Initiative
World Resources Institute
10 G Street, N.E.; Suite 800
Washington, DC 20002

Dear Dr. Kennedy:

Thank you for appearing before the Subcommittee on Energy on June 26, 2018, to testify at the hearing entitled "The Shifting Geopolitics of Oil and Gas."

During the hearing, Members asked you to provide additional information for the record, and you indicated that you would provide that information. To facilitate the printing of the hearing record, please respond to this request with a transmittal letter by the close of business on Friday, August 3, 2018. Your responses should be mailed to Kelly Collins, Legislative Clerk, Committee on Energy and Commerce, 2125 Rayburn House Office Building, Washington, DC 20515 and e-mailed in Word format to kelly.collins@mail.house.gov.

Thank you again for your time and effort preparing and delivering testimony before the Subcommittee.

Sincerely,



Fred Upton
Chairman
Subcommittee on Energy

cc: The Honorable Bobby L. Rush, Ranking Member, Subcommittee on Energy

Attachment



WORLD
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July 31, 2018

The Honorable Fred Upton, Chairman, Subcommittee on Energy
Committee on Energy and Commerce
2125 Rayburn House Office Building
Washington, DC 20515-6115

Dear Chairman Upton:

I would like to express my thanks for the opportunity to appear before the Subcommittee on Energy to testify at the June 26th hearing on "The Shifting Geopolitics of Oil and Gas."

I would also like to thank Congressman McNerney for his question regarding the relative employment for renewables versus oil and gas when considered against the amount of energy produced. While I did not have that information available at the hearing, I have attached my response based on data from the 2018 installment of the U.S. Energy and Employment Report (USEER), along with a fact sheet World Resources Institute produced in early 2017.

I would be happy to follow-up further if you or other members of the committee have questions or are looking for additional information.

Sincerely,



Kevin M. Kennedy
Deputy Director, U.S. Climate Initiative

cc: The Honorable Bobby L. Rush, Ranking Member, Subcommittee on Energy
The Honorable Jerry McNerney
Ms. Kelly Collins, Legislative Clerk, Committee on Energy and Commerce
Christina DeConcini, Director, Government Affairs, World Resources Institute

Attachments

Additional information for the record of the June 26th, 2018, hearing of the Energy Subcommittee of the U.S. House Committee on Energy and Commerce on “The Shifting Geopolitics of Oil and Gas,” from Kevin Kennedy of the World Resources Institute:

Congressman McNerney asked about the relative employment for renewables versus oil and gas when considered against the amount of energy produced. The 2018 installment of the U.S. Energy and Employment Report (USEER) contains data that address this question.

The U.S Department of Energy (DOE) released the USEER in 2016 and 2017 to survey and quantify energy jobs across the domestic economy. As the DOE elected not to produce a 2018 iteration of the Report, the Energy Futures Initiative (EFI) and the National Association of State Energy Officials (NASEO) opted to publish an updated report applying the same survey methodology as previously used by the DOE. This report can be found at <https://www.usenergyjobs.org/>.

The 2018 USEER finds that in 2017, wind and solar accounted for over 450,000 jobs combined, as seen in Table 1, copied below. Looking at renewable energy more broadly, nearly 35% (approximately 650,000) of Americans employed in the overall Electric Power Generation and Fuels sectors were working in wind, solar, geothermal, hydroelectricity and bioenergy. (These sectors include “the entire range of business activities that support both fuel extraction and production, as well as utility-scale and distributed electric power generation.”) Employment in the U.S. renewables industry is disproportionately high relative to other energy sources, as these technologies supplied only 10% of U.S. primary energy consumption in 2016, as seen in Appendix B of the 2018 USEER. Meanwhile, oil/petroleum and natural gas each employed fewer workers than did renewable energy, although they accounted for 37% and 29% of the nation’s energy supply, respectively.

Energy efficiency, often regarded as a source of renewable energy, employed 2.25 million Americans in 2017, more than double the number of Americans employed in traditional fossil fuels. In fact, the conclusion of the Report states, “The growth of energy efficiency jobs and the penetration of energy efficiency technologies continues to be an important indicator of economic development opportunities and increasing competitiveness for American industries.”

As wind and solar generation continues to grow and burgeoning technologies such as battery storage and offshore wind begin to take off, there is tremendous potential for increased employment in the renewable energy sector.

I have also attached a fact sheet that WRI produced in early 2017 that provides additional information on clean energy employment in the U.S.

Table 1.
Generation and Fuels Employment by Major Energy Technology Application and Detailed Technology Application

	Electric Power Generation	Fuels	Total
Solar	349,725	-	349,725
Wind	107,444	-	107,444
Geothermal	7,927	-	7,927
CHP	27,239		27,239
Bioenergy	12,385	104,446	116,831
Corn Ethanol	-	34,522	34,522
Other Ethanol/Non-Woody Biomass, Including Biodiesel	-	20,083	20,083
Woody Biomass Fuel for Energy and Cellulosic Biofuels	-	31,428	31,428
Other Biofuels	-	18,414	18,414
Low Impact Hydroelectric Generation	11,531	-	11,531
Traditional Hydropower	55,341	-	55,341
Nuclear	64,743	8,962	73,705
Coal	92,843	74,180	167,023
Natural Gas	66,385	312,364	378,749
Oil/Petroleum	12,407	510,015	522,422
Advanced Gas	41,034	-	41,034

³⁷ It is important to note that these figures include all employees who spend some portion of their time on a specific technology.

³⁸ The Solar Foundation has been producing annual solar reports since 2010, using a substantially similar methodology to this report. See <https://tsfcensus.org> for more information. The Solar Foundation 2017 *National Solar Jobs Census*/BW Research Partnership

Source: Energy Futures Initiative and the National Association of State Energy Officials, *U.S. Energy and Employment Report*, May 2018. Available at <https://www.usenergyjobs.org/>.



CLEAN ENERGY JOBS GROWTH IN THE UNITED STATES

The clean energy economy in the United States—including wind, solar, and efficiency industries—is putting more and more Americans to work. Solar and wind energy are among the most dynamic industries in the nation, employing hundreds of thousands of Americans. Energy efficiency efforts employ millions, while saving money for both companies and consumers. This fact sheet gathers the latest data on how many Americans are working in clean energy and where the jobs are located.

FACT 1 The U.S. Department of Energy estimates that about 800,000 Americans were employed in low-carbon-emission generation technologies in early 2016, including renewables, nuclear, and advanced/low-emission natural gas. By comparison, 160,000 Americans worked in coal in early 2016. (DOE)¹

FACT 2 Solar jobs are among the fastest growing employment sectors in the nation. In 2016, the U.S. solar industry created jobs 17 times faster than the overall economy. One out of every 50 new jobs added in the United States in 2016 was created by the solar industry.² The solar workforce grew 25 percent from 2015 to 2016, reaching 374,000. (Solar Foundation)³

FACT 3 Wind jobs are also a rapidly expanding job sector in the U.S. Wind employment grew 32 percent between 2015 to 2016, reaching 102,000. The Bureau of Labor Statistics predicts that wind-turbine technicians will be the fastest-growing occupation over the next 10 years. (Dept. of Energy)⁴

FACT 4 In early 2016, 2.2 million Americans were employed, in whole or in part, in the design, installation, and manufacture of energy efficiency products and services. Of these, more than half, 1.4 million are in the construction industry. (BLS)⁵

FACT 5 The share of the auto industry working with alternative fuels and fuel-efficient vehicles is growing. Of the 2.4 million workers in the industry in early 2016, more than 259,000 work with alternative-fuel vehicles (including natural gas, hybrids, plug-in hybrids, all electric, and fuel cell/hydrogen vehicles) and at least 710,000 jobs are focused on improving fuel economy or transitioning to alternative fuels. (DOE)⁶

CONTACTS

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World Resources Institute Fact Sheets bring together data and content from WRI's research as well as other respected organizations to provide a basis for informed discussion and decision making on urgent issues at the nexus of environment, economic growth and human well-being.

Find other fact sheets in this series at:
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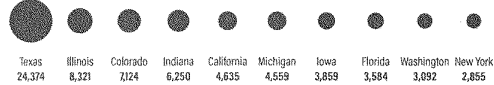
FACT Manufacturing jobs from renewables exist all over the country. More than 500 factories build wind-related parts and materials in 43 states, making everything from major wind turbine components such as nacelles, blades, towers, and gearboxes to internal components like bearings, slip rings, fasteners, and power converters. They are especially concentrated in the Midwest, the Northeast, and Appalachia.⁷

FACT Texas is the top state for wind jobs and California is the top state for solar and energy efficiency jobs. Florida, Illinois, Massachusetts, Michigan, New York, North Carolina, and Ohio also rank in the top 10 in multiple categories of clean energy jobs (see figure at right).

WHERE ARE CLEAN ENERGY JOBS LOCATED?



Top Ten States for Wind Jobs



Top Ten States for Solar Jobs



Top Ten States for Energy Efficiency Jobs



Data from the state charts⁸ in the Department of Energy's 2017 National Energy and Employment Report⁶ can be used to provide a ranking of the top 10 U.S. states for wind, solar, and energy efficiency jobs.

NOTES AND REFERENCES

1. Department of Energy, National Energy and Employment Report, January 2017, p. 8. https://energy.gov/sites/prod/files/2017/01/13/2017%20US%20Energy%20and%20Jobs%20Report_0.pdf.
2. The 2016 data refer to Q1 (January to March). The 2015 data refer to Q2 (April to June).
3. The Solar Foundation, National Solar Jobs Census 2016, <http://wwwthesolarfoundation.org/solar-accounts-1-50-new-u-s-jobs-2016/>.
4. Department of Energy, National Energy and Employment Report, January 2017. https://www.energy.gov/sites/prod/files/2017/01/13/2017%20US%20Energy%20and%20Jobs%20Report_0.pdf
5. Bureau of Labor Statistics, Fastest Growing Occupations. https://www.bls.gov/emp/rep_table_103.htm.
6. Department of Energy, National Energy and Employment Report, January 2017, p. 8. https://energy.gov/sites/prod/files/2017/01/13/2017%20US%20Energy%20and%20Jobs%20Report_0.pdf.
7. The 2016 data refer to Q1 (January to March).
8. Department of Energy, National Energy and Employment Report, January 2017, p. 9. https://energy.gov/sites/prod/files/2017/01/13/2017%20US%20Energy%20and%20Jobs%20Report_0.pdf.
9. American Wind Energy Association, U.S. Wind Industry 2015 Annual Market Update, p. 1. <http://awea.files.cms-plus.com/Annual%20Report%20Manufacturing%202015.pdf>.



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